FEBRUARY 28, 1955

the OIL AND GAS JOURNAL

AROMATIC CHEMICALS

. . . A new field where petroleum is displacing coal

Page 74

- Railroad Plans to Build 800-Mile Product Pipeline . 77
- More Accuracy With New Well Depth-Pressure Recorder . 105

NEW SUCCESSOR TO THE SACK

On the scrap heap of history is a stack of old cement sacks . . . tossed there fifteen years ago when Halliburton originated Bulk Cementing. This major improvement plugged many holes in the sack cementing method. It required a lot of special equipment like this big pneumatic trailer, but the benefits were worth it. Bulk Cementing eliminates the time-consuming labor of handling and dumping hundreds of sacks . . . it completely wipes out waste for there's no way cement can spoil, and any left over can be turned back for credit. More important, custom made cements are mechanically mixed with greater accuracy and more thorough blending of additives. When you're looking for ways to plug holes in your operating costs, take a close look at the benefits of Bulk Cementing. One of Halliburton's 45 Bulk Cement stations is near you.

HALLIBURTON OIL WELL CEMENTING COMPANY
DUNCAN, OKLAHOMA

PAGE 1 ONE . . . a glance ahead

New markets for natural-gas liquids are being studied intensively by several big companies. Ideas include: reforming and other processes to permit more blending with motor fuel; pipeline movements to industrial centers and promotion of natural gasoline as factory fuel.

Big interest of refiners in mild hydrogen treating will blossom in introduction of a half-score new processes this year. Not really hydrogenation, though often called such, hydrogen treating promises wonders in improving the entire range of products, removes sulfur, nitrogen, other unwanted constituents.

First two-stage centrifugal compressor for gas transmission will soon be tested in Texas. Line's steady load factor justifies trial of this new equipment instead of usual arrangement of several compressors in series.

Settlement of Saudi-Arabian-Trucial Coast boundary dispute, expected soon, will open new Middle East area to oil exploration. Only Trucial Coast discovery, completed more than a year ago, has been plugged as noncommercial because high-sulfur gas accompanied small light-oil production, and boundary dispute has kept operators away since.

Octane race is backing up into the testing laboratories. Research method is under attack as not giving proper results on today's highest-octane fuels. Some refiners want to go back to motor method as giving better check on actual engine performance.

Natural-gas pipelines are looking ahead toward more interconnections of systems to permit gas exchanges. Eventually would form virtual "grid", tend to near-uniformity in prices, services, operating practices. FPC wants law to give it controlling hand in this development.

Petroleum supply and demand are both at all-time highs, but there are dangers. Supply (both crude and products) has been increasing at higher rate than demand justifies. Demand this time last year was very weak, so comparisons are deceptive. Stocks could climb fast with ending of heating season.

Renting light-weight aluminum pipe with quick couplings is becoming popular with drillers and producers for water and fuel supplies while drilling and for temporary well connections during completing and testing.

the OIL AND GAS JOURNAL

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OIL AND GAS PIPELINES • REFINING • PETROCHEMICALS

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TECHNOLOGY—OPERATION

Curbing Engine Knock 100

By C. L. Fleming, Jr., N. V. Hakala, L. E. Moody, R. W. Scott, and C. O. Tongberg

Elimination of high-boiling materials in motor fuel reduces octane requirements. This conclusion results from field studies made by the authors in Esso's Linden laboratories. For typical 1953-54 model cars, an octane advantage of 5.7 is obtained by using volatile fuel with multi-viscosity lubes.

Precision Well Recorder 105

By W. R. Postlewaite, A. C. West, and H. J. Cavigli

A precision type of well-depth-pressure-recording gage has been developed by Standard Oil Co. of California. This instrument provides a degree of accuracy not attainable with other portable subsurface instruments.

Underground Refinery Storage 109

By Patrick F. Dougherty

Sun Oil Co., Ltd., is now operating underground caverns for process storage of L.P.G. products at its 15,000-bbl. per day Sarnia, Ont., refinery. Three salt caverns have been completed, and two more are being washed in the Salina formation underlying the new refinery.

Fundamentals of Gas Lift—10 113

By C. V. Kirkpatrick

This installment devoted to gas-lift-valve spread is the final in this series. The gas-lift valve does not open at the same pressure at which it closes. The difference between the wellhead pressure at which it opens and that at which it closes is the "spread" of the valve.

Pipeline Weld Inspection 115

By W. W. Thayer

Radioactive sources are big aids for inspection of pipeline welds. But they should be handled with care. Some of the new radioactive materials offer great promise in this application.

Developing a Reef Trend 117

By W. J. McPherson

Large gas reserves and a thin oil column in the Devonian reef at Rimbey-Homeglen field have caused difficult completion and production problems. Coning of oil and gas into producing wells has occurred in this Canadian field.

West Seminole Gasoline Plant 122

By Guy W. Duren, Jr., and B. O. Buck

This new plant is compact in layout and so arranged that it is operated by two men per tour. Total operating and maintenance force is 22. The plant utilizes partial demethanization in the absorber reboiler. Perforated plate trays are used for all process vessels.

Cut Wildcat Costs 126

Humble cuts wildcat costs by planning and coordinating the knowledge and efforts of the geologists, engineers, superintendents, and tool pushers involved.

Pipeline Patrol 143

How to fit sleeves on old bolted couplings. Natural Gas Pipeline Co. of America is reinforcing couplings with welded sleeves on its Texas-Chicago line.

REGULAR FEATURES

Engineering Fundamentals 129-130
Field Processing 131-132
Questions on Technology 134
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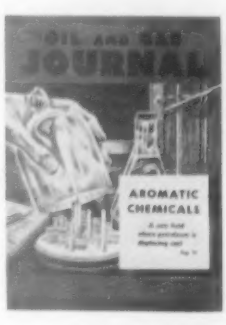
COVER STORY

Benzene, xylene, and toluene are being produced in increasing amounts from oil. These aromatic chemicals, once obtained as byproducts from the coke oven, are made by catalytic reforming. The ones to watch are the xylenes, particularly p-xylene. This material is the starting point for the synthetic fiber, Dacron.



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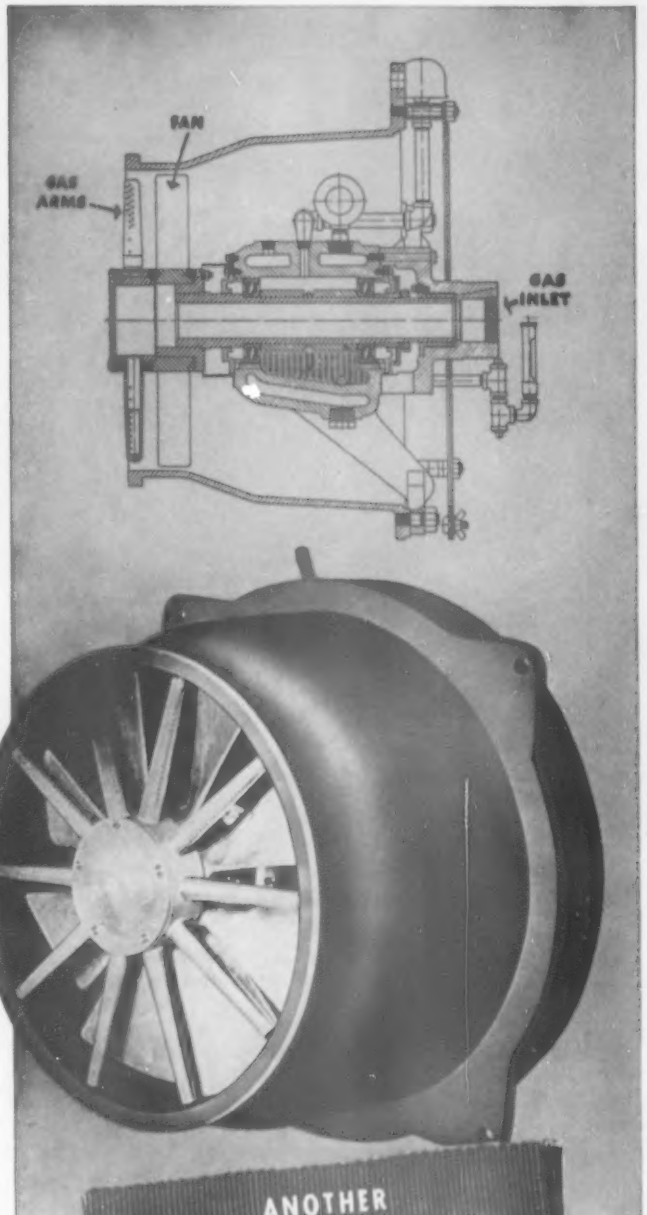

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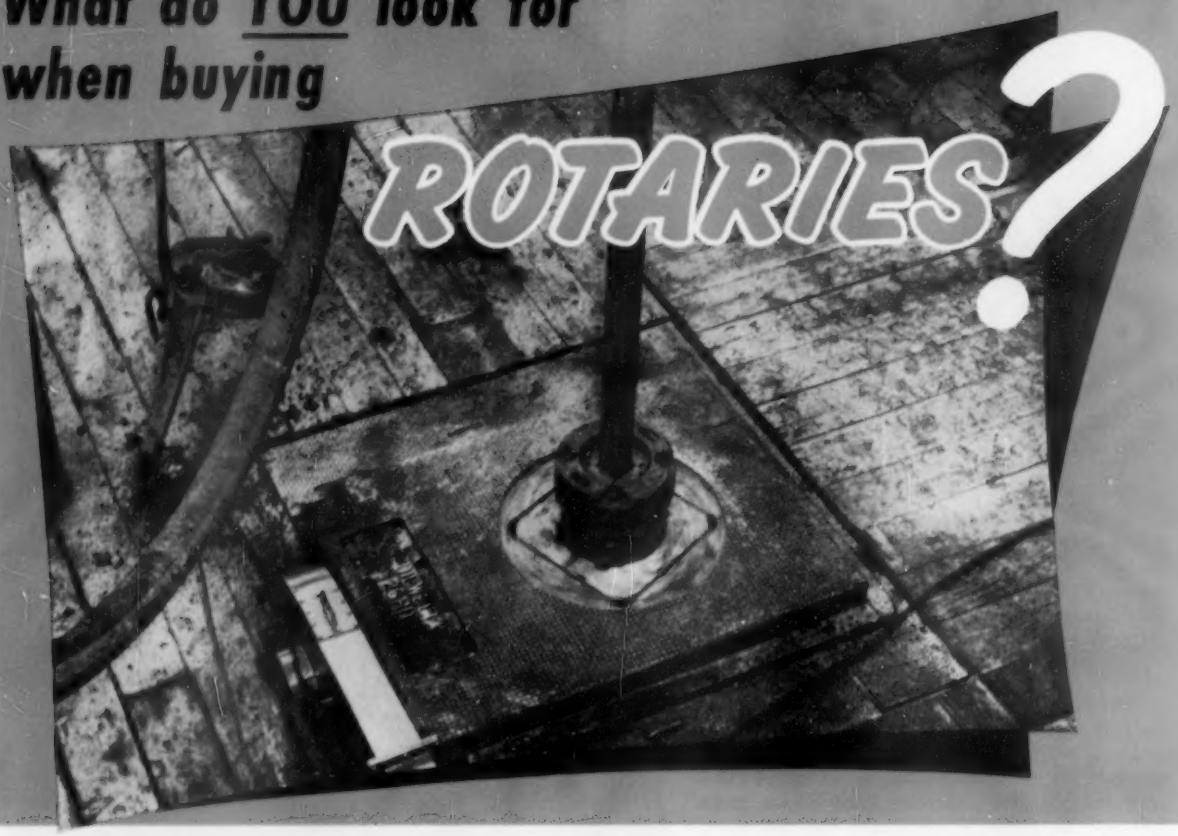

If it's DEPENDABLE PERFORMANCE

. . . you'll like the quiet operation, freedom from vibration and foolproof design of "Oilwell" Rotaries——from the smallest to the largest models. Self-centering, angle-contact, large-diameter main ball bearings completely support the turntable and its drill-string load. Cast-steel turntable is precision balanced for smooth, vibrationless rotation. Large-diameter, pinion-shaft assembly is equipped with a safe, simple and convenient pinion-shaft lock.

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. . . you'll be amazed at the ease with which the pinion-shaft assembly can be serviced and either outer or inner bearings replaced when needed without stripping the entire shaft. Drilling mud is prevented from working through a grease-sealed labyrinth between the turntable and base during "wash-down" operations, and a flexible sealing ring bends upward to form a tight seal when struck by mud from below. With reasonable attention, the oil reservoir in "Oilwell" Rotaries need never become contaminated with mud.

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. . . you'll appreciate the way "Oilwell's" patented oil-bath lubricating system maintains a constant flow of oil to cushion wearing surfaces regardless of operating speeds. This reduces wear to a minimum. Rigid one-piece cast-steel bases are heavily ribbed to provide high strength-for-weight ratios and form oil reservoirs completely surrounding the turntables. Conservative load ratings for all models provide extra strength for emergencies.

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"Oilwell" Rotary	17½-C & 17½-D	20½"	26-HD
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Gear Ratio	3.28:1	3.82:1	3.84:1
Maximum Table Openings	17½ ins.	20½ ins.	26 ins.

Contact **. . . your nearest "Oilwell" Representative the next time you're buying Rotaries and let him give you complete specifications on the "Oilwell" line . . . or ask for Booklet No. 7-53.**

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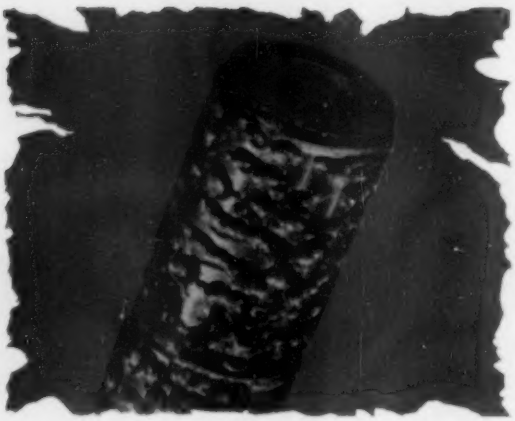
This is trouble...

This unretouched photo shows a plunger section taken from a pump operating in a Mid-Continent oil field. The extreme pitting indicates what corrosive and abrasive action can do to a pump part when it is not metallurgically suited to the well condition. A wrong specification of parts for the specific well condition might be the cause of failure.



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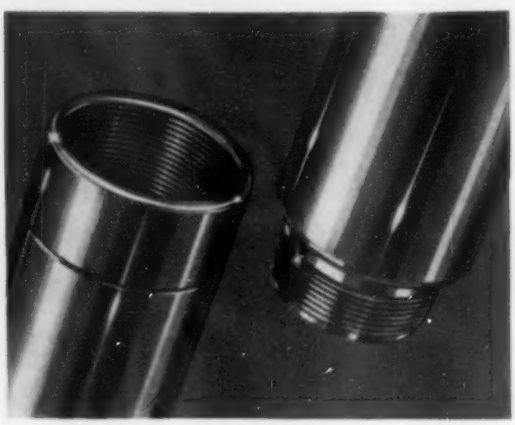

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Send for Bulletin No. 5005

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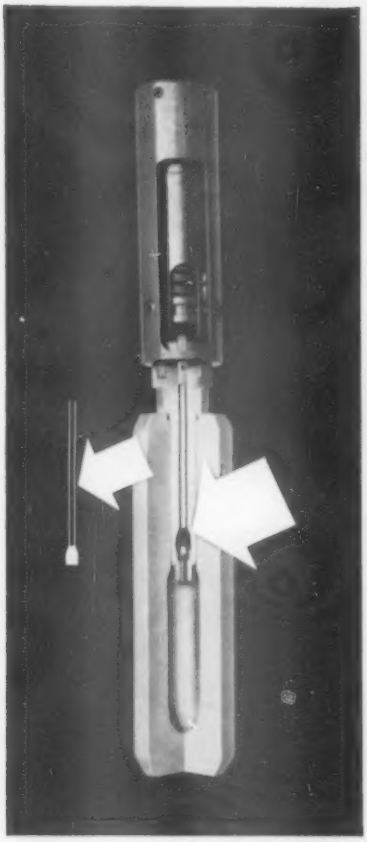

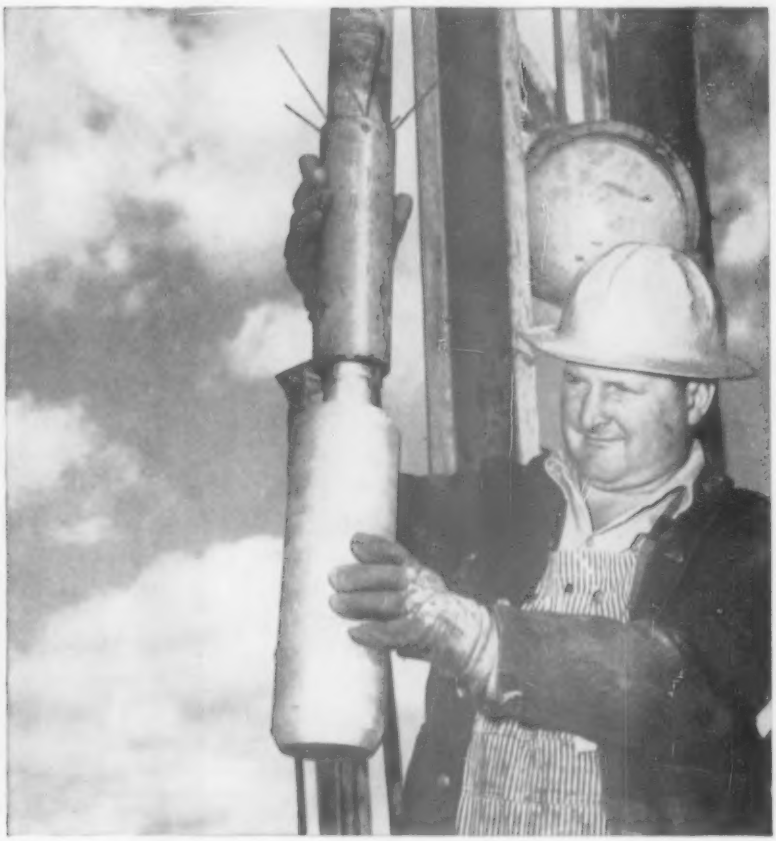

Type B Bridge Plug manufactured by the McCullough Tool Company. B. F. Goodrich Chemical Company supplies only the Hycar rubber.

Hycar helps BRIDGE PLUG hold its fire

WHEN it is necessary to set a casing plug, the McCullough Bridge Plug sets the stage by a controlled explosion in the hole—with Hycar acting as monitor.

This bridge plug is all metal, contains a cavity filled with an explosive. The firing mechanism consists of two electrical conductors coated with Hycar, leading to a Hycar insulated detonating plug. It is lowered into the hole on an electric wire line. The explosion is set off, the bridge plug expands and makes sealing contact with the inside of the casing.

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Century three-phase Weathergard motors are smaller and lighter due to use of more uniform Silicon-Laminated Steel; thinner, tougher "MYLAR" Slot insulation.

These Century Weathergard motors are PERFORMANCE RATED© for pumping units and all oil industry applications. For more detailed specifications ask for Bulletin 14-141-PI.

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Six layers of insulation guard against moisture, dust, dirt, vibration. Tough plastic insulates each wire. A heavy coating of Century Red Sealer wraps up these provisions for longer trouble-free life.

Century cast rotors are practically indestructible, and are carefully balanced to keep down vibration.

The ball bearings are factory-lubricated, but each Century motor has grease points for re-lubrication, PLUS provision against over-lubrication.

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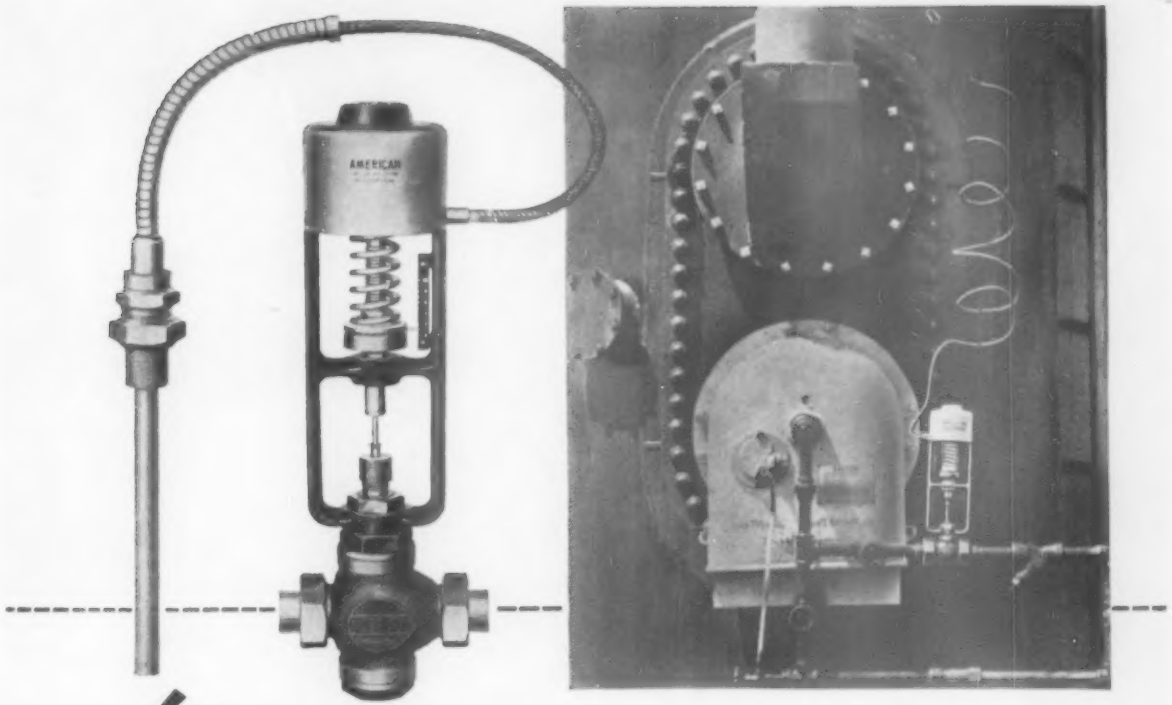

You SELECT THE TEMPERATURE...

the American Temperature Regulator maintains it constantly

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Day after day, these compact, easy-to-install and durable regulators provide dollar savings by maintaining temperature within required limits. Securely housed in indoor plants or withstanding the elements in field installations, American Temperature Regulators serve industry dependably wherever temperature control means dollar savings.

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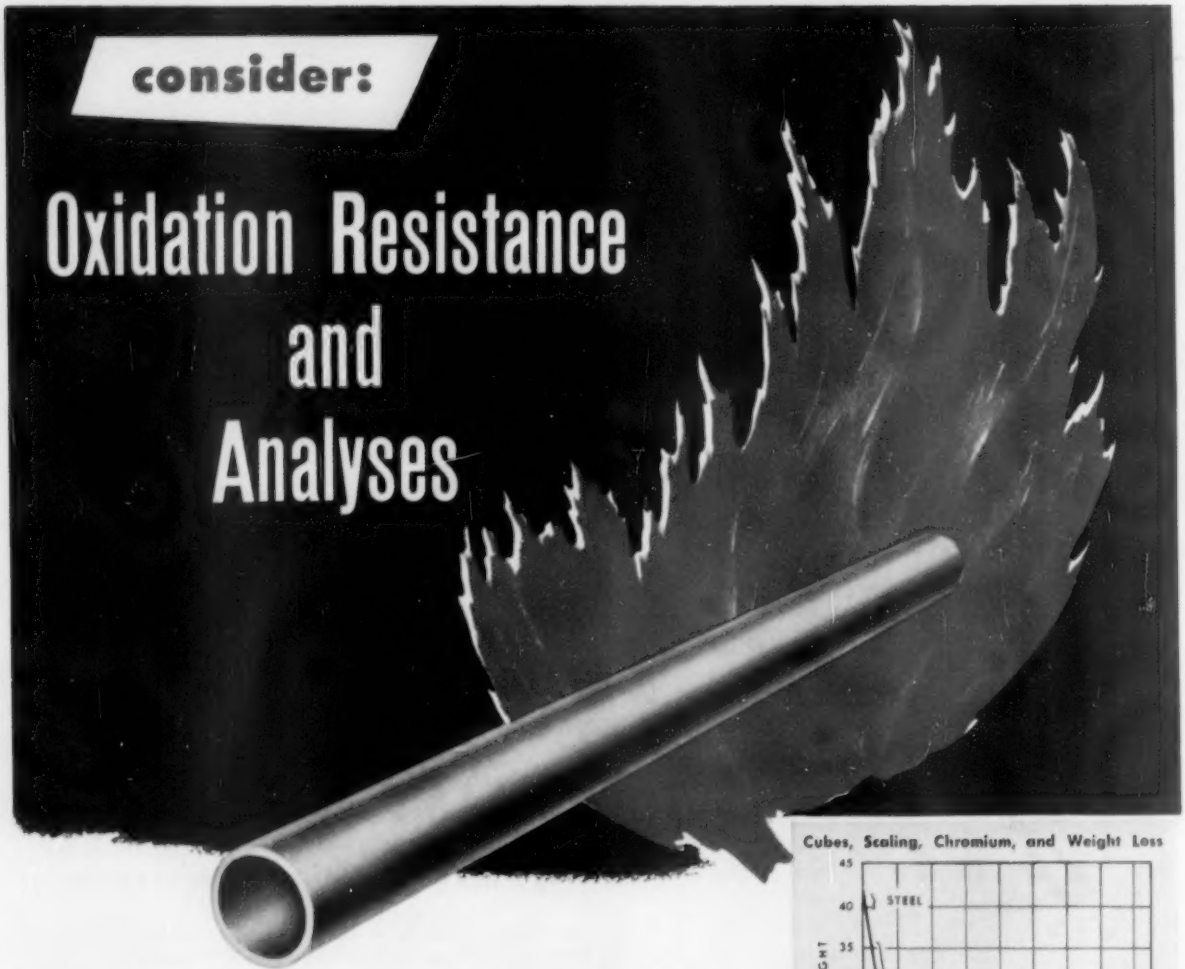
Oxidation Resistance and Analyses

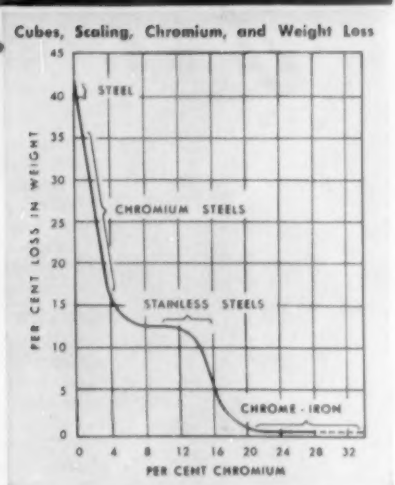


The loss of metal, through scaling, at high temperatures is a costly phenomenon that must be considered in the selection of stainless tubing where conditions of extended excessive temperatures are present.

When choosing a specific Croloy for your operation it is well to review the factors that govern the service life of the tube. For example, B&W Croloy 18-8S (AISI Type 304) can operate, without excessive scaling, at a maximum temperature of 1650 F. Here, as in most other cases, the temperature limit may have to be revised downward should combustion products or gases high in sulphur compounds or vanadium-containing ash be present.

This is but one general example of the intricacies involved in choosing the proper stainless tubing for a specific use. For virtually any application B&W can provide either seamless or welded stainless tubing in any number of grades, in a broad size range. Help in obtaining the best stainless tubing —pressure or mechanical—for your applications is available through B&W Regional Sales Offices and a nationwide network of experienced tubing distributors. Mr. Tubes—your link to B&W—will be pleased to furnish detailed answers to your stainless tubing problems.

TA-4058(SSM)



Many tests have been made under different temperatures with steels having various chromium content to determine their resistance to oxidation. Chart above clearly explains what happens — oxidationwise —to metals when exposed to a temperature of 1835 F for 48 hours.

B&W SEAMLESS and WELDED TUBES

THE BABCOCK & WILCOX COMPANY
TUBULAR PRODUCTS DIVISION

Beaver Falls, Pa.—Seamless Tubing; Welded Stainless Steel Tubing
Alliance, Ohio—Welded Carbon Steel Tubing

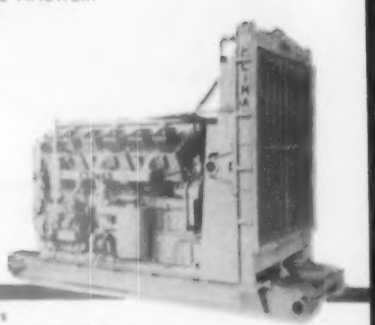
All your horses working — All the time

No place in industry is dependable power of such importance as it is in the oil fields. Climax Blue Streak Engines are famous for rugged, dependable service under the most adverse conditions. They are on the job all the time and you know when your power is Climax that all your horsepower works for you all the time.

Climax has an engine for every oil field need. Call your nearby Climax Blue Streak distributor for complete information on dependable power.

WHERE POWER IS YOUR PROBLEM . . . CLIMAX IS THE ANSWER.

climax BLUE STREAK ENGINES



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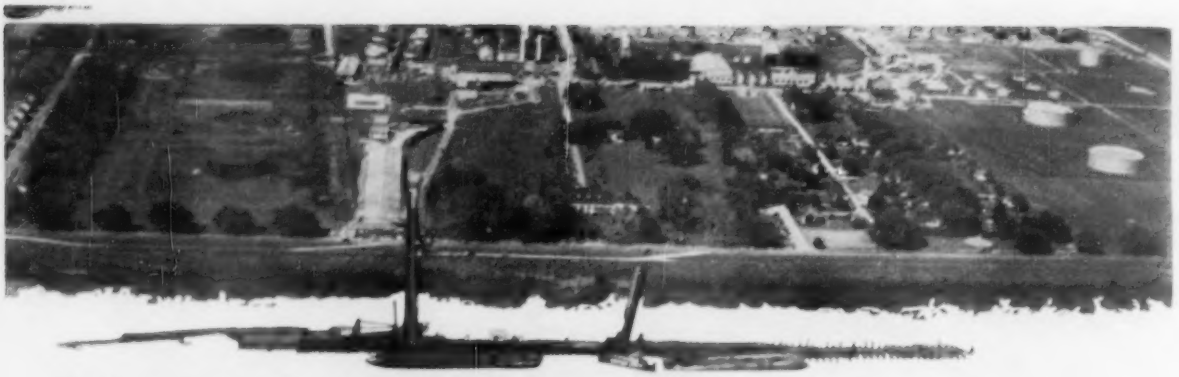

W. HORACE WILLAMS CO., INC. DOES IT AGAIN!

An oil company suffered the loss by fire of 630 feet of loading wharf. It was discovered that the lower portions of piles were still sound. A unique design of steel frames, supported by sound portion of piles, was employed. A concrete deck was poured over the steel frames. This resulted in a considerable saving and at the same time gave the resultant structure a fire-resisting construction. W. Horace Williams Co., Inc. engineering skill and know how saved this company considerable money!

Scene at left shows the river with the reconstructed fire-damaged portion of wharf. Notice the steel frames above old piles and the concrete deck.

W. HORACE WILLIAMS COMPANY

ENGINEERS INCORPORATED GENERAL CONTRACTORS

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NEW ORLEANS

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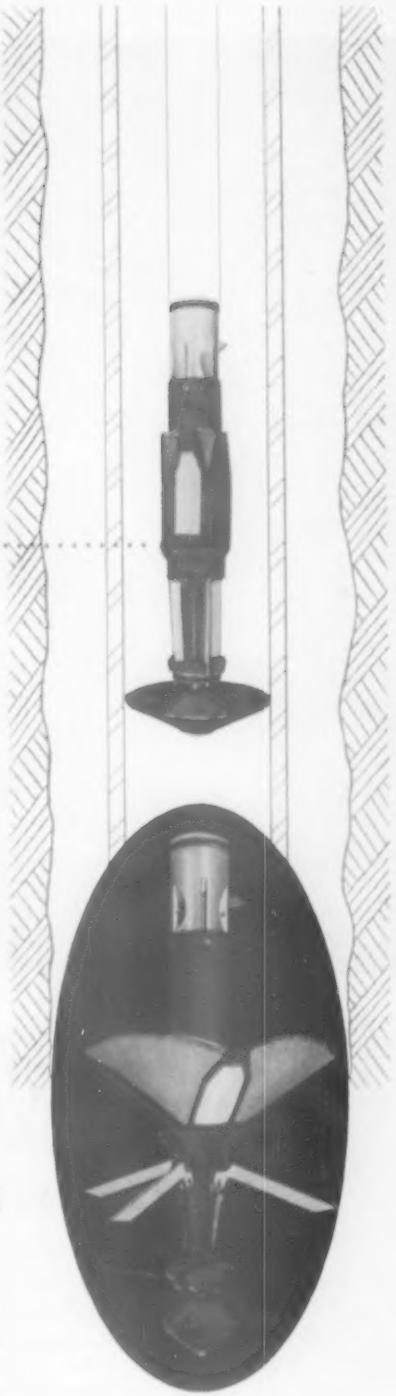
BUILDS PLUGS FASTER WITH SPECIAL SLURRIES

HALLIBURTON'S

DUMP BAILER SERVICE



Ten sacks of cement or 60 gallons of other special slurries can be placed for an effective, enduring plug *in just one run* with the streamlined equipment of Halliburton's Dump Bailer Service. Securaloy bailer sections with full opening bottoms allow all materials to be discharged in a body—helping to eliminate the contamination and costly delays of older methods that try to build a plug with only one or two sacks of cement at a time.

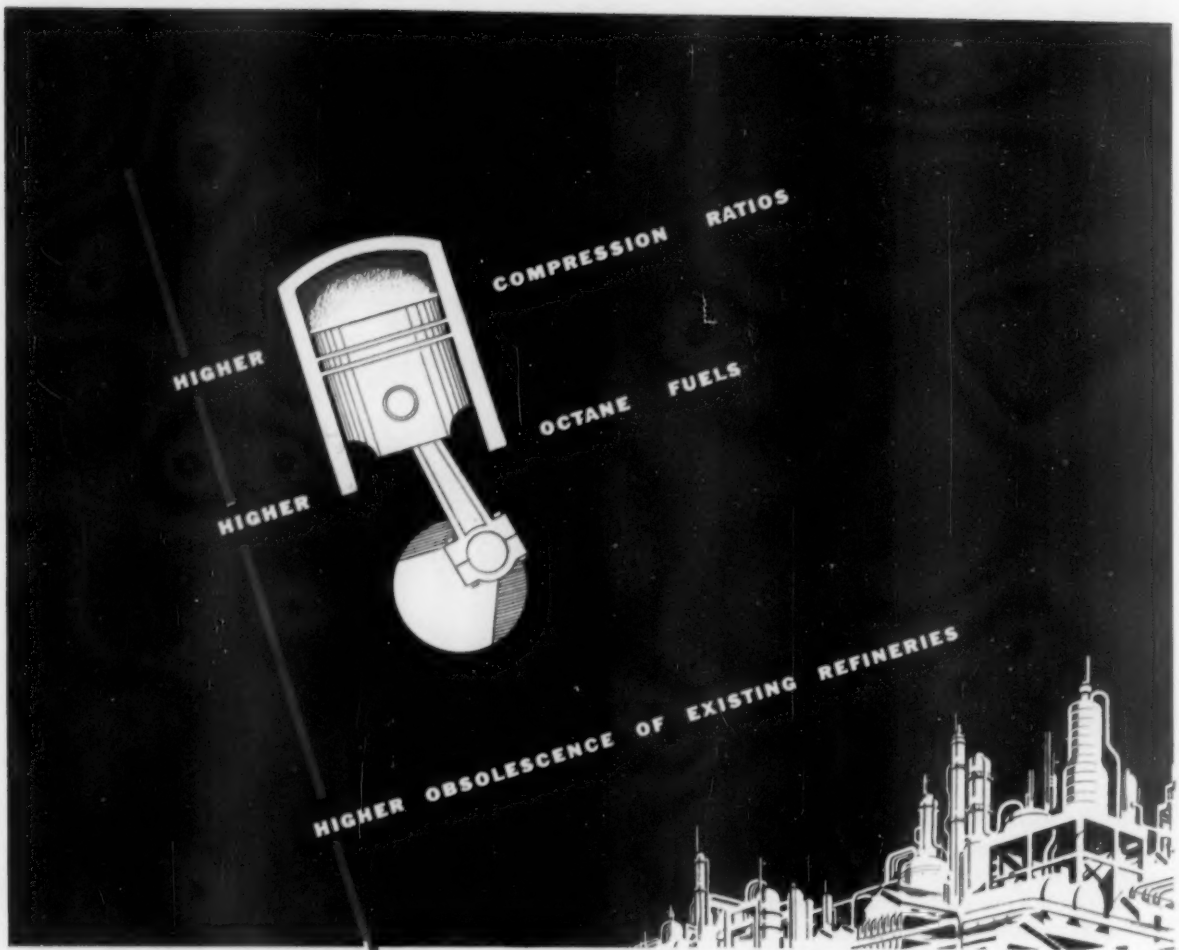
An improved DB Bridging Basket works with the bailer sections to speed permanent or temporary plug building in casing or open hole. Only a slight pickup on the bailer sections is required to set and open the umbrella-type basket and to dump the Cal-Seal, Hydromite or other plugging materials in a synchronized operation. This simple technique is used for building bridges or shot tamps, shutting off water, consolidating loose formations and repairing casing leaks. Halliburton equipment and materials now make it possible for all these remedial jobs to be completed with a real reduction in down-time that means important savings!

You will be interested in the modern Dump Bailer developments that are described in a new Halliburton bulletin. Helpful information on dump bailer applications, operation of bridging baskets and other equipment, securaloy removal and uses for special cements and plastics is included. For your free copy of the new bulletin or a report on the Dump Bailer Service that can help you, call your local or district office of the Halliburton Oil Well Cementing Company.

HALLIBURTON

CEMENTING SERVICES

211 SERVICE CENTERS—JUST MINUTES AWAY FROM ANY RIG



here's why FW modernization

can solve this problem at lowest overall cost

"BALANCED MODERNIZATION" by Foster Wheeler is more than just the addition of new process units in place of old ones. It includes maximum utilization of old but still serviceable equipment in the new plant. Old towers are adapted to new processes — old pumps, lines and tanks integrated into the new scheme. Scrapping of much costly equipment is avoided.

Over the past five years, Foster Wheeler has completely modernized a number of large refineries. This "know how" is at your service. *Foster Wheeler Corporation, 165 Broadway, New York 6, N.Y.*

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Reliable data scientifically obtained . . . a down-hole picture of your well

A SUB-SURFACE log is as reliable as the skill and equipment used to obtain it . . . and the scientific knowledge used to analyze and evaluate the down-hole data.

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This complete down-hole logging service, including lithology, drilling rate and depth, plus on-location core analysis, means faster drilling, lower costs.

Ask your Baroid field man or call the Baroid Well Logging Office in your area for complete details on this additional Baroid service to the drilling industry.

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• First and foremost! And with WECO Unions you get perfect, positive sealing *every* time. WECO's precision-machined ball and cone seating surface seals tighter than a clam—holds high pressures, shock and vibration with a bulldog's grip.

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• WECO stars in that department. For WECO Unions have micro-machined Acme Threads that make-up quickly—break-out fast—time after time—without damage or distortion. But that's not all. WECO's tough wing nut and heavier wall sections can take the toughest beating and ask for more—month after month. Here is *service* that *saves* on job after job.

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• Most assuredly! WECO Unions have been field-proven for 20 years by thousands of oil men all over the world. And from that success have earned the reputation of the finest unions made: the long-lasting, trouble-free unions you can depend on for sealing and service.

• You, too, will find what you are looking for in unions when you call your supply store for WECO.

PRESSURES 1,000 to 15,000 p.s.i. SIZES 1" through 12".

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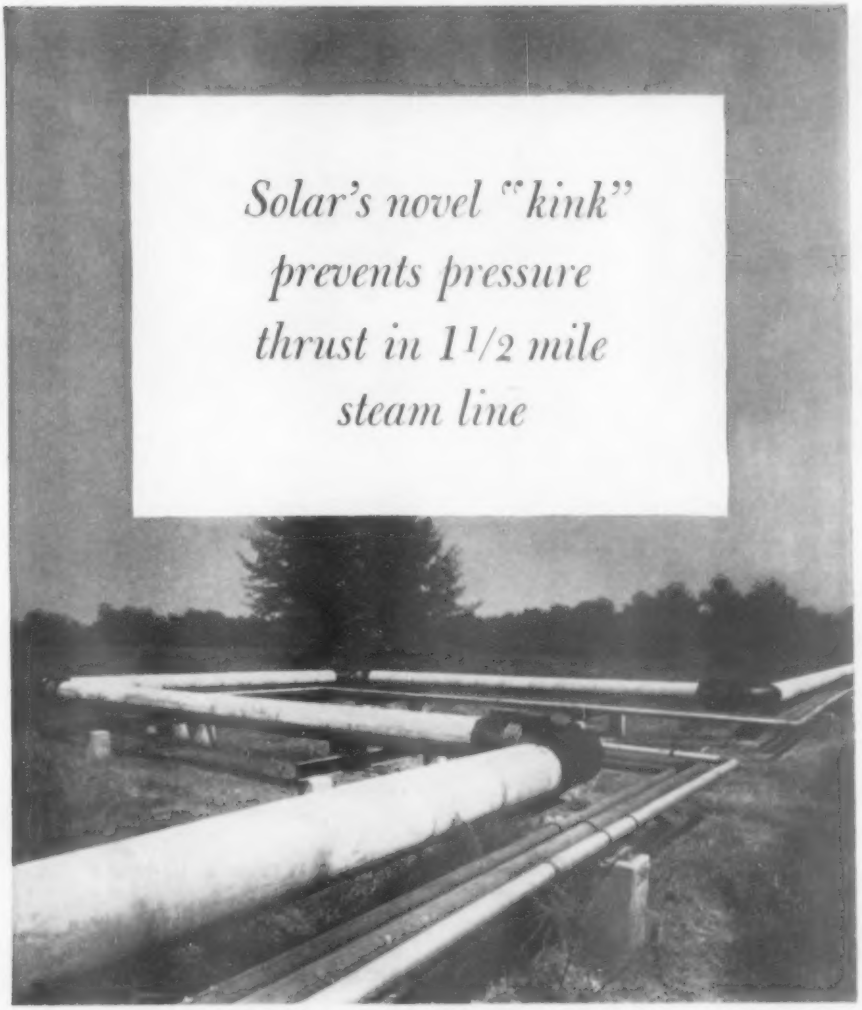
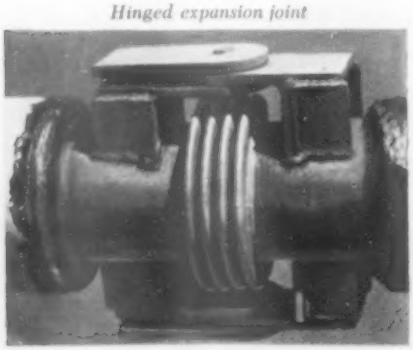
WELL EQUIPMENT MFG. CORP. • Division of Chiksan Company • HOUSTON 1, TEXAS



THIS HINGED EXPANSION LOOP was designed by Solar engineers to solve an unusual problem at Lion Oil Company's Barton Plant, in Luling, La. The steam line shown above runs more than 1½ miles, operates at 200 psi and a temperature of 560 F. The problem was to stop pressure thrust and accommodate a large amount of pipe expansion.

Hinged expansion joint



The expansion loop employs four Sola-Flex hinged bellows joints, each requiring only 4 degrees of angulation. Yet three of these loops permit *twenty-seven feet of expansion*, thus accommodating the expansion of the entire 1½ mile steam line!

Experienced Solar engineering teams are always ready to help solve your high and low pressure piping problems. And Solar can follow through—with standard or custom-built expansion joints and convoluted couplings for all your piping needs. Send for Sola-Flex catalogs today.

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DESIGNERS, DEVELOPERS AND MANUFACTURERS OF METAL ALLOY PRODUCTS

This is What Solar Offers You

Solar specializes in the manufacture of precision products from alloys and special metals for severe service. Solar's experience since 1927 is unduplicated in this field. Solar skills and facilities range from research, design and development through to mass production. Wherever heat, corrosion or difficult specifications are problems, Solar can help you solve them.

PLANTS. *In San Diego and Des Moines (photograph above). A total of 1,400,000 sq ft of floor space. Approximately 5,000 employees. Annual sales over $65,000,000.*

EQUIPMENT. *Production equipment for all types of metal fabrication—forming, machining, welding, brazing, casting, coating. Extensive laboratory and testing equipment. Facilities for development, prototype, limited or mass production.*

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Current orders include aircraft engine and airframe parts, alloy castings, pneumatic ducting, atomic energy components. Customers include some of the most honored names among aircraft and industrial companies in the U.S. and Europe.

SPECIAL PRODUCTS

Bellows. *"Sola-Flex"® bellows and expansion joints in many designs from ½ in. up to the world's largest, 28 ft in diameter.*

Gas Turbines. *Solar "Mars" 50 hp engines for auxiliary generator sets, ground carts, portable fire pumps; Solar "Jupiter" 500 hp engines in variable and constant speed models.*

Ceramic Coatings. *"Solaramic"® is the Solar trade mark for a family of coatings that protects metals from heat, corrosion, galling and abrasion.*

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FURTHER INFORMATION
Your inquiry regarding any Solar product or service will receive prompt attention. Address
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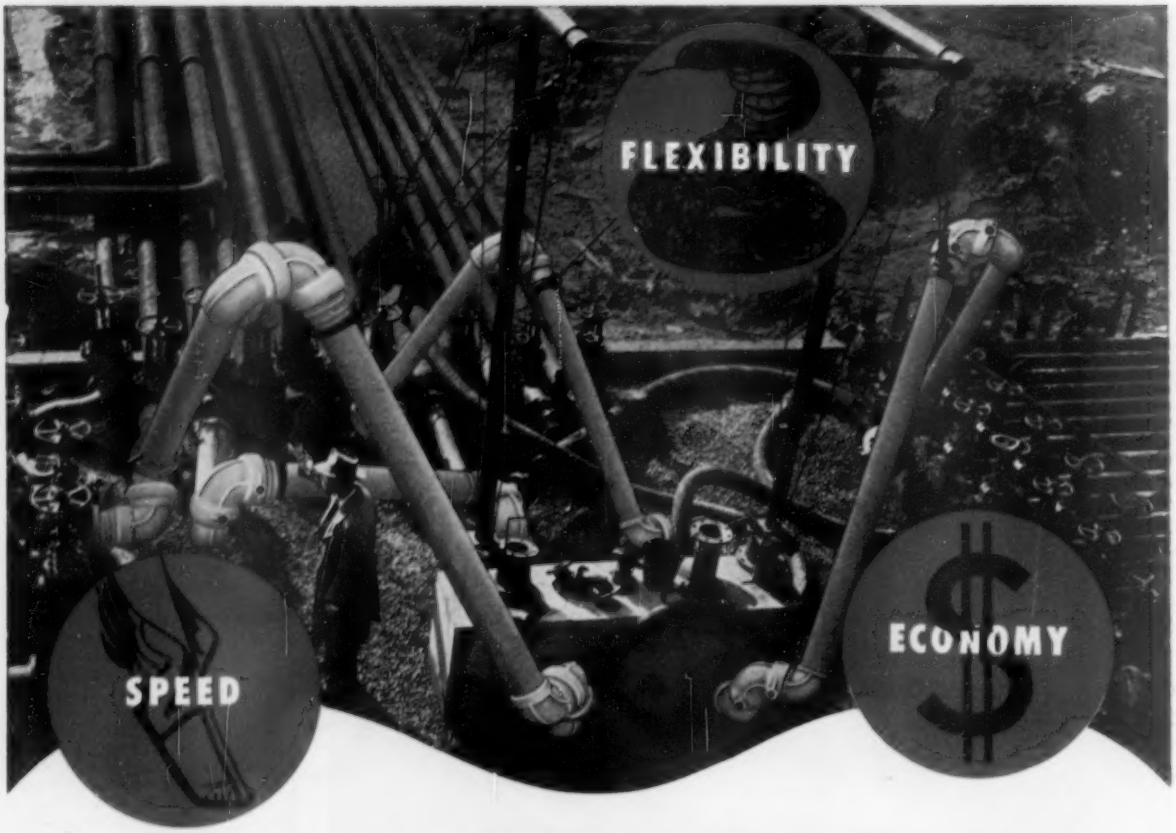
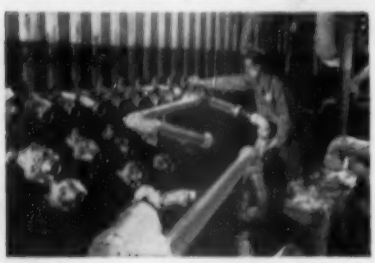
Department A-77
San Diego 12, California



CHIKSAN Swivel Joints illustrated in this installation, facilitate the speedy, economical handling of various fluids through 16 lines from loading dock to manifolding pit — a distance of 800 feet. Since each line leads to a separate tank through the manifold, cross contamination is eliminated.



CHIKSAN Swivel Joints in the pump manifold above enable operator to pull base stock from outside storage into the plant and direct flow to proper vessel or proportioner.

The Flow of Enterprise Relies on

CHIKSAN

Ball-Bearing Swivel Joints

CHIKSAN Manifolding Saves 3 Ways!

- ORIGINAL INSTALLATION
- NO CONTAMINATION LOSSES
- LOW COST OPERATION

Original cost of CHIKSAN flexible line manifolding installations often run as much as 50% less than fixed line manifolding operations which incorporate costly multiple valve and line systems.

A CHIKSAN manifolding operation is simplified in its entirety — providing complete flexibility, mobility and ease of operation in limited spaces.

CHIKSAN manifolding installations reduce line hook-up time — keep pit floor clear of lines thereby providing greater working areas.

CHIKSAN manifolding operations facilitate the transfer of all types of fluids safely and rapidly under extreme climatic conditions with no possibility of cross contamination.

CHIKSAN manifolding installations are specifically engineered for long life — easy and economical maintenance, and render years of trouble-free operation.

Our Engineering Research and Development Department will welcome inquiries on your manifolding problems.

Write for Catalog 53-C, Dept. OGJ-2A

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"Why should I buy Sargent pumps?"

—because Sargent builds the best pumps and offers the most complete service in the industry. These are important factors in producing lower cost oil.

SERVICE Sargent recognizes the importance of pump maintenance and provides the most complete service facilities in the industry. This service is always available through conveniently located Sargent field stores throughout the country, which are staffed by company trained pump experts.

PUMP DESIGN Sargent is recognized as the leader in the development of bottom hole production pumps, and has recently introduced a completely new bottom hole hydraulic pumping system. Sargent today manufactures every A.P.I. bottom hole pump design offered to the petroleum industry.

PUMP METALS Sargent pioneered the development of special metals, and today offers a complete selection of pumps of metals to meet any and all well conditions. Through team work of management, research, engineering, skilled craftsmanship and practical experience, coupled with the most modern equipment and manufacturing practices, Sargent has endeavored to produce a completely reliable product which will gain, foster, and hold the good will* of the customer.

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Frankly, because they give you more for your money... they are the best pumps built anywhere.

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Heavy duty screw type valve seats.

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Walking beam horsehead to keep vertical alignment of polish rods.

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Positive detachable standing valve puller. (Tubing Pumps.)

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Rod Rotator.

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Safety sucker rod wrench.

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First rod insert liner pump which could be removed on sucker rods without pulling tubing.

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Long stroke sub-surface hydraulically operated pump.

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Sucker rod hanger.

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Hard stainless steel pump liners and plungers.

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Automatic rod hook-on attachment.

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Pressed-in liner pumps.

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BUILDS PUMPS THAT BUILD GOOD WILL

"GOOD WILL" is the disposition of the pleased customer to return to the place where he has been well treated.

U. S. Supreme Court

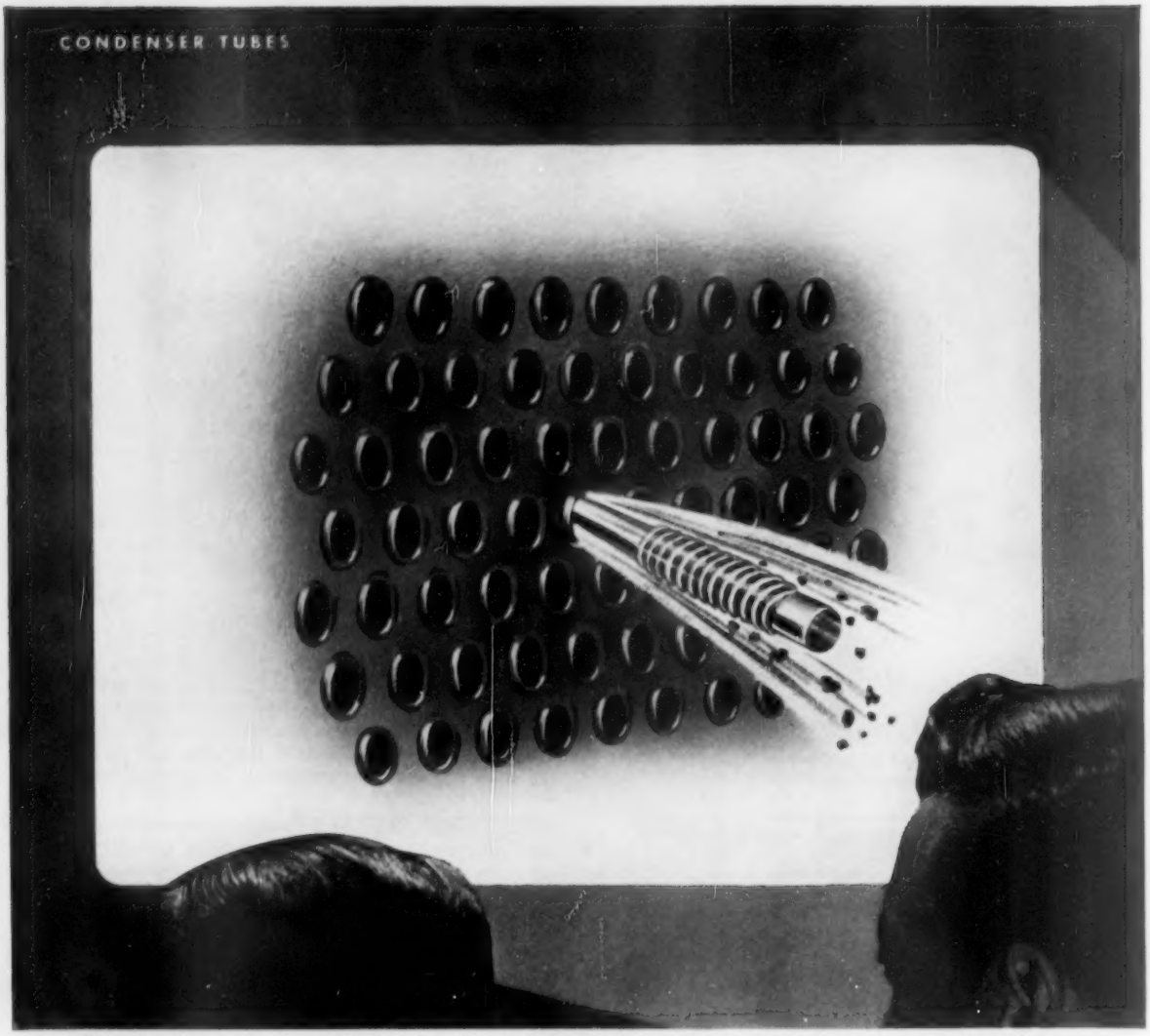


Illustration shows how short bristle brushes—shot through tubes by a high-pressure water stream—remove loose deposits.

COOLING WATER: how its composition affects life of condenser tubes

You can't always pick your plant site where water is noncorrosive. Economics may not permit it. If your plant is located inland, cooling waters generally will be relatively noncorrosive. Tide water plants, however, will have corrosion problems, particularly if the sea water is polluted with industrial or domestic wastes. This is especially true if the organic matter in the sewage is able to ferment under anaerobic conditions. Then sulfides are likely to form. In an enclosed harbor or in a dead-end channel, water may be more or less stagnant. There it is particularly subject to infestation by anaerobic bacteria.

Frequent cleaning of tubes will remove slimes containing bacteria. At the same time it will remove sulfide scales and increase tube life. You can also remove slimes by chlorinating polluted water frequently. This may aid in breaking down unwanted sulfide films on the inner walls of the condenser tubes.

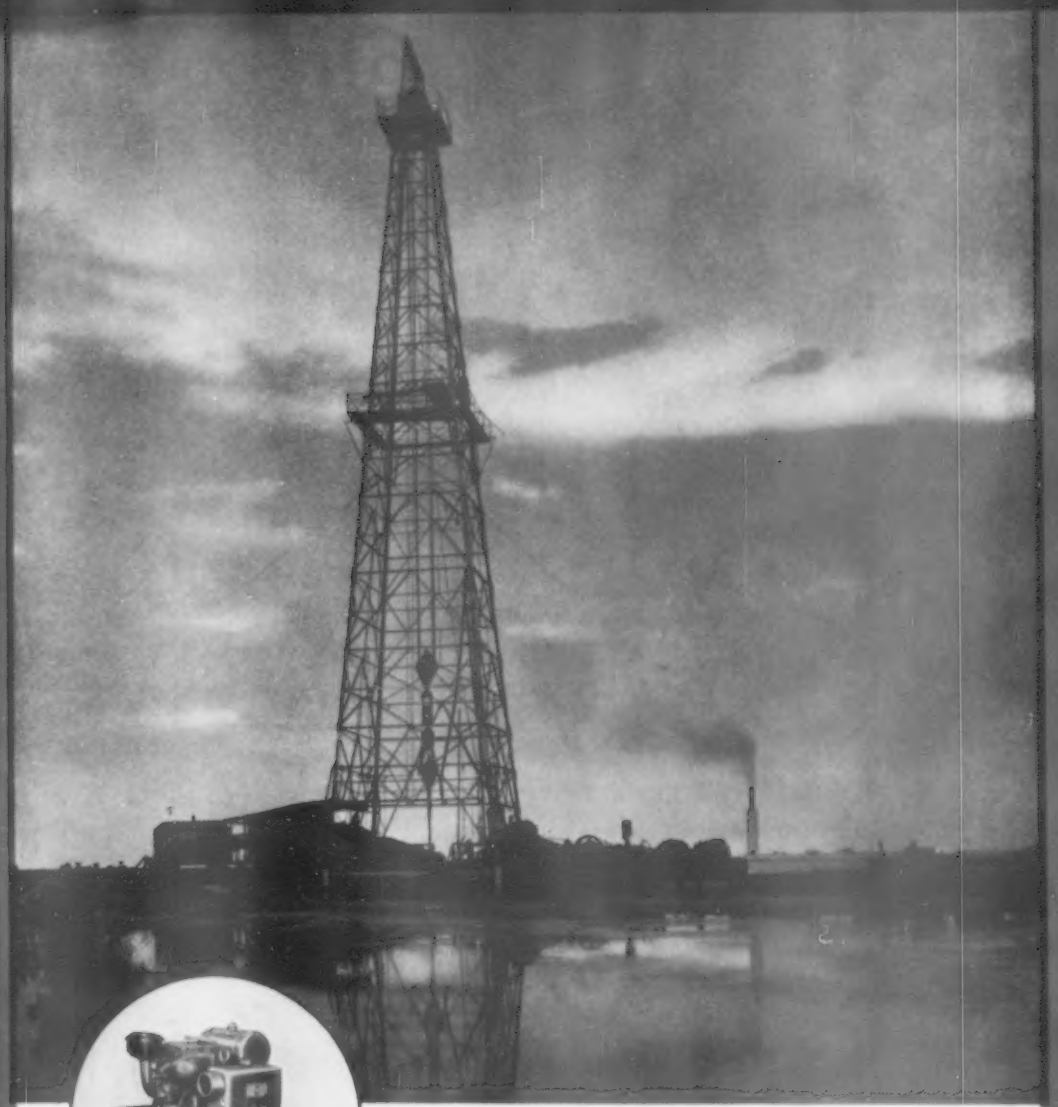
In some cases you can dredge the channel bottom near the water intake to remove accumulations of decaying vegetable matter. This will help to maintain longer tube life.

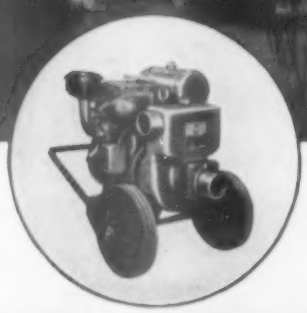
Cooling water is only one factor affecting tube life. Publication B-2 "Anaconda Tubes and Plates for Condensers and Heat Exchangers," discusses *all* the important operational factors, and gives much other useful information. And, of course, our Technical Department stands ready to assist you in the selection of tube alloys from our extensive line. *The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.* 54104

ANACONDA®

Tubes and Plates for Condensers and Heat Exchangers

Arsenical Admiralty-439; Ambraloy-927; Cupro Nickel, 30%-702; and other copper alloys.*
*U. S. Patent No. 2,003,685 (Orig.)





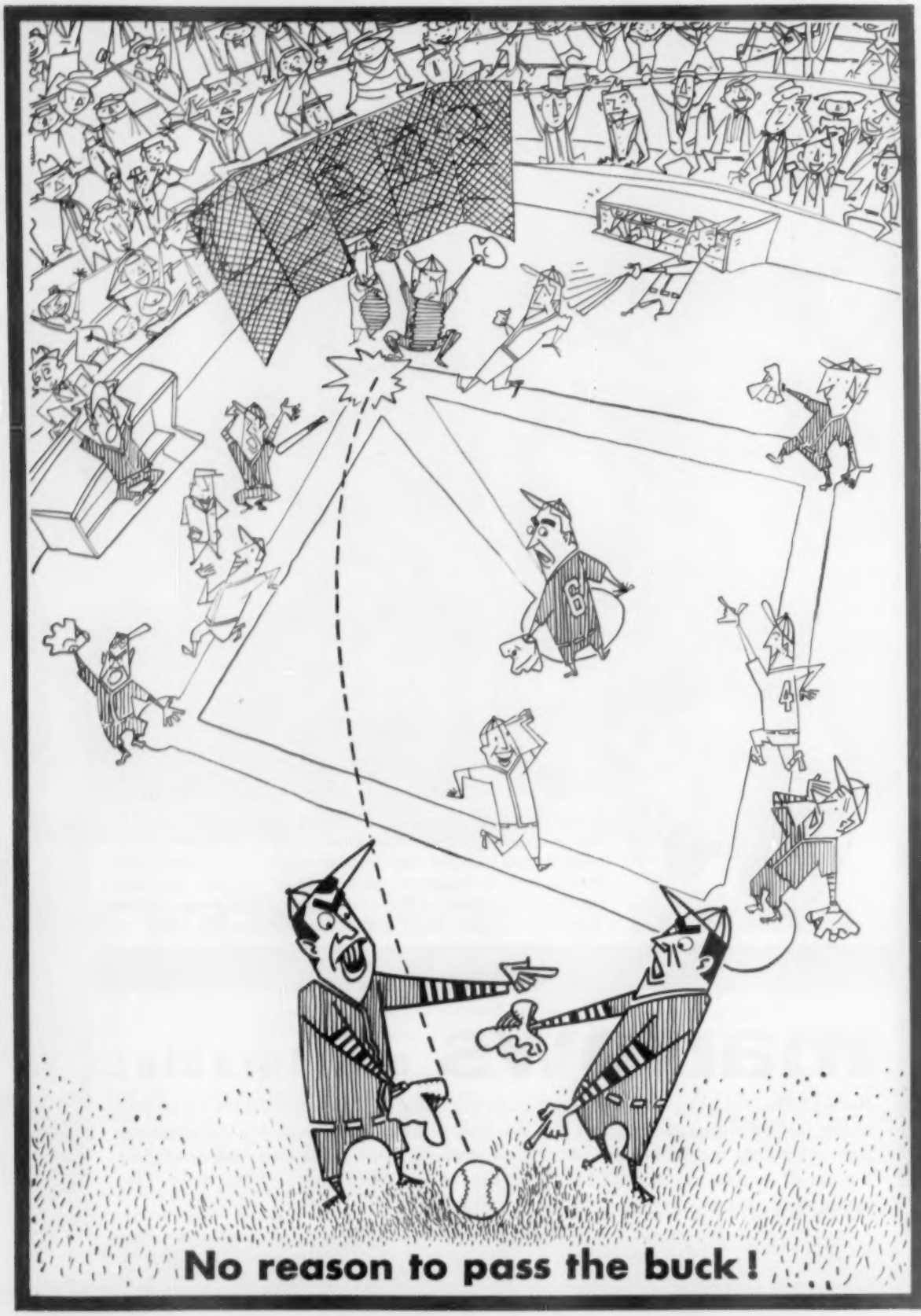
Dawn to dusk or 'round the clock duty doesn't bother tool pushers who need dependable pumping. They're finding Marlow Self-Primers and Marlow "Mud Hog" Diaphragm Pumps are an important part of their job. For pumping wastes from cellars, or for washing down rigs, brake cooling service, and utility water supply, Marlows can't be beat!

marlows are durable!

Marlows are "old hands" at oil country pumping. They're built to handle the tough jobs in the field efficiently, day in and day out, with little attention and low maintenance. Known for their rugged dependability by majors and independents alike, more and more veteran oil men are making Marlows their *first choice!* Make sure with Marlow . . . get *all* the facts from your Marlow Dealer or write for Bulletin O-53.

MARLOW PUMPS • RIDGEWOOD, NEW JERSEY

Division of BELL & GOSSETT COMPANY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HMA'S are designed, built and tested by Clark

You're never in the middle when you own a Clark "Midget Angle." Compressor, skid, radiator and piping — in fact all major components — are designed and built by Clark, under one roof. There's never a reason to pass the buck!

By building all major components, Clark is able to match them perfectly and to operate them as fully assembled units. You are assured that your "Midget Angle" will be "right" when you get it — ready to go to work without time-consuming field assembly.

For field compressors in the 85-440 bhp range, you'll certainly want to know more about Clark "Midget Angles" — their ruggedness, their perfect balance and their many other outstanding features. Consult your nearest Clark representative and write for Bulletin 126.

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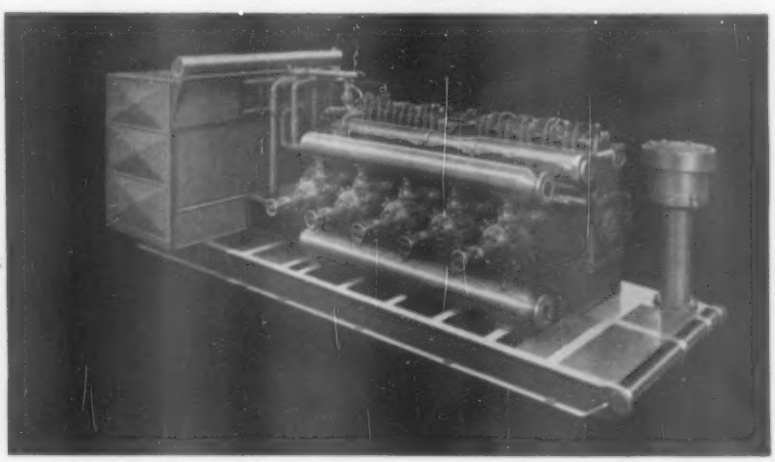

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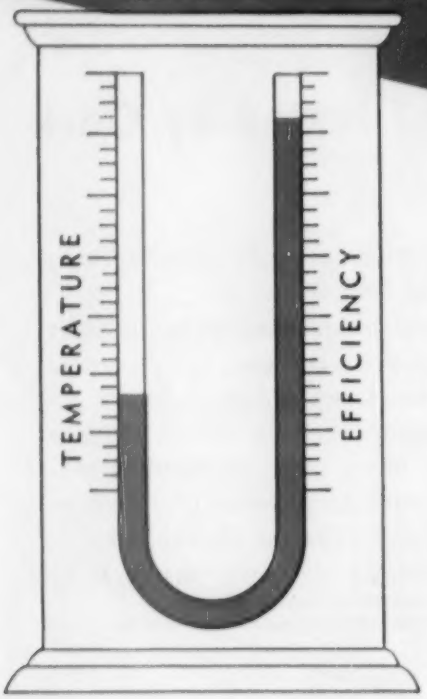

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● Now in operation 8,000 ft. offshore, west of Seal Beach, is the first tideland drilling operation off the California coast. Brown Marine Drilling Company, Long Beach, is the contractor, and put together the packaged rig that is being used. Four Murphy Diesel Fuel Engines are a key part of the rig. Three of the Murphys, each rated at 200 H.P. continuous, are on the floor compounded to power the table, drawworks and main pump. The fourth Murphy of the same size powers the standby pump.

On jobs like this and ashore, Murphy Diesel Power is proving itself to be an oilman's kind of power—responsive, dependable and economical. Ask your Murphy Diesel Dealer to show you what Murphy Diesel can do for you.

MURPHY DIESEL COMPANY

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Engines and power units 90 to 260 H.P.; dual-fuel engines, 135 to 215 H.P.; marine propulsion and auxiliaries, 90 to 225 H.P.; generator sets 60 to 154 K.W.

Photo courtesy
Brown Marine Drilling Company

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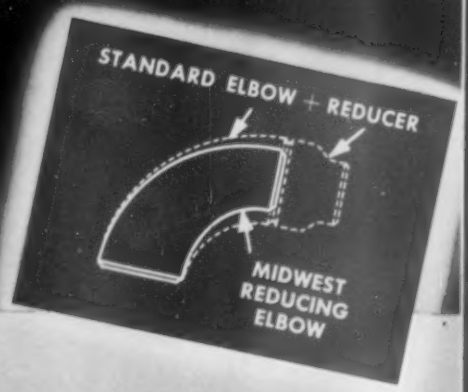
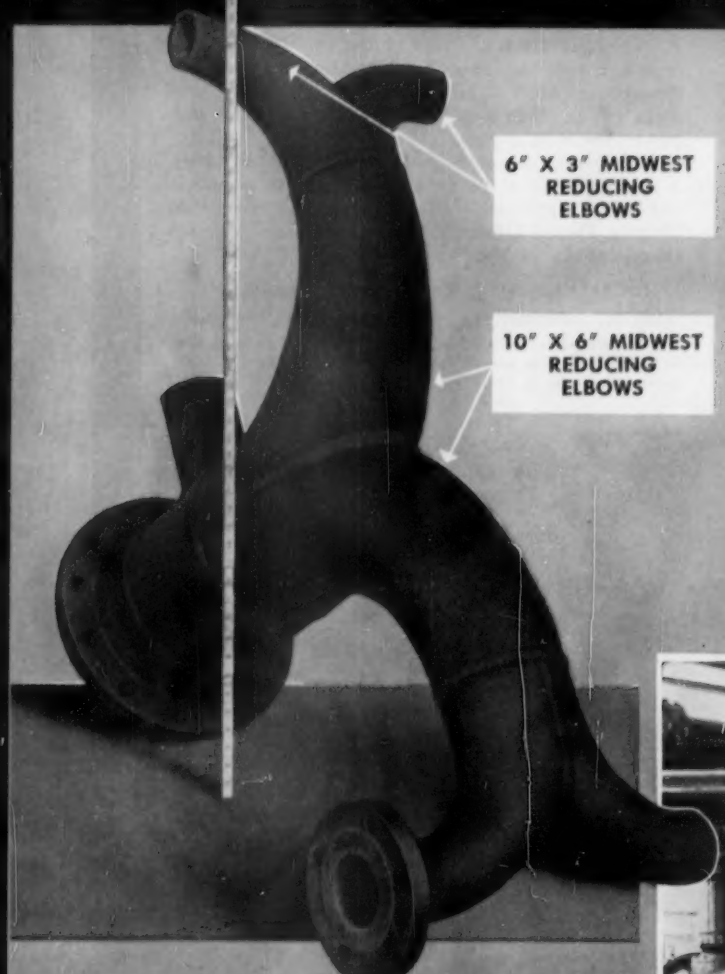
304

Better Piping at a Better Price by Using MIDWEST REDUCING ELBOWS



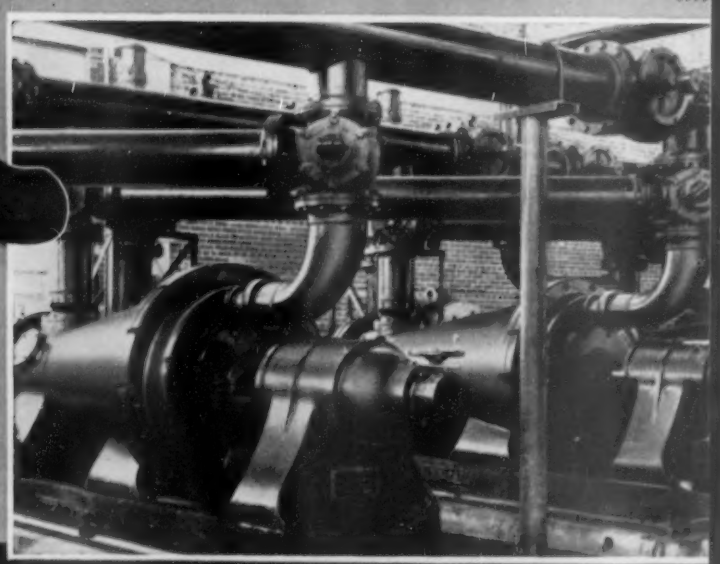


The Midwest Reducing Elbow offers important advantages in both piping design and piping cost. It needs only two welds instead of the three required by a standard elbow and a reducer (see sketch above). There is also a saving in layout time. Turbulence and pressure drop are reduced by the gradual taper . . . less space is needed . . . insulation is easier . . . and piping appearance is improved.

Only Midwest Reducing Elbows are available from stock in sizes to 16" . . . larger on special order. They have the same dimensional accuracy, uniformity of wall thickness, exact included angle and true center-to-end dimensions of Midwest Straight Elbows. For further information, ask for Catalog 54.

6999

↑ Midwest Reducing Elbows made it possible to fabricate this transformation piece for a boiler feed suction line so that it could be installed in the limited space available and still get the benefit of streamline flow. There was also a cost saving in comparison with a less efficient and bulky assembly made with straight tees, ells and reducers.



→ Paper stock flows with minimum resistance through Midwest Reducing Elbows from 8" connection on Jordan to 10" header. Other advantages over standard elbow and reducer: a saving in cost and space, and improved appearance.

MIDWEST WELDING FITTINGS
Improve Piping Designs
and Reduce Costs

MIDWEST PIPING COMPANY, INC.
Main Office: 1450 South Second Street, St. Louis 4, Mo.
Plants: St. Louis, Passaic, Los Angeles and Boston

At last!

A TRUE VINYL MASTIC!

Complete protection in a single coat—10 mils thick!

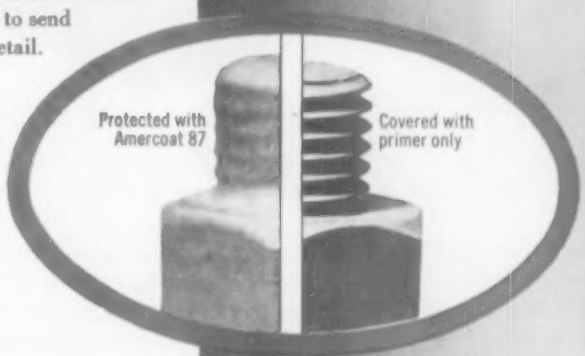
Amercoat No. 87 will cut your maintenance costs because one coat gives you the thickness and protection previously available only through the application of multiple coats.

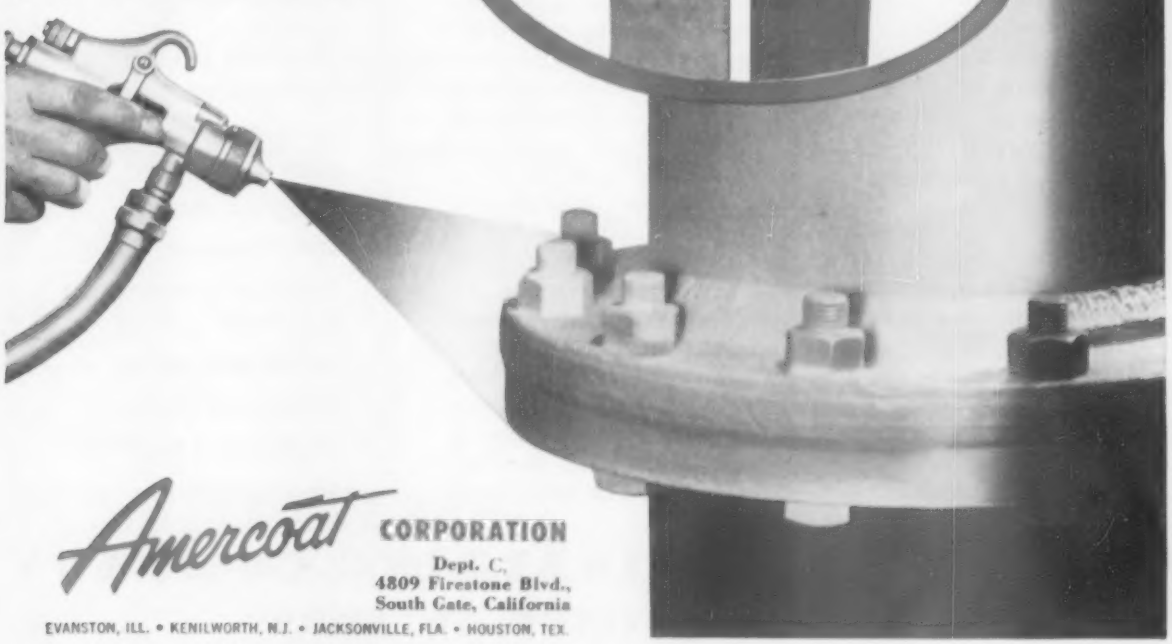
Amercoat No. 87 is the brand new solution to an old problem, for it combines the time-tested chemical and weather resistance of a vinyl with the extra thickness that was heretofore available only in conventional mastics.

Amercoat No. 87 is easily applied with standard industrial spray equipment. Only one cross-spray coat, over a primed surface, is required for complete protection. Because **Amercoat No. 87** is a true vinyl, it is not limited to black, but is available in a variety of colors.

You can save up to 50% of your labor costs with **Amercoat's new vinyl mastic No. 87.** We will be pleased to send you a bulletin describing this new coating in detail.

Notice that the sharp bolt threads, welds and sharp corners are completely protected with one coat of Amercoat No. 87—10 mils thick!



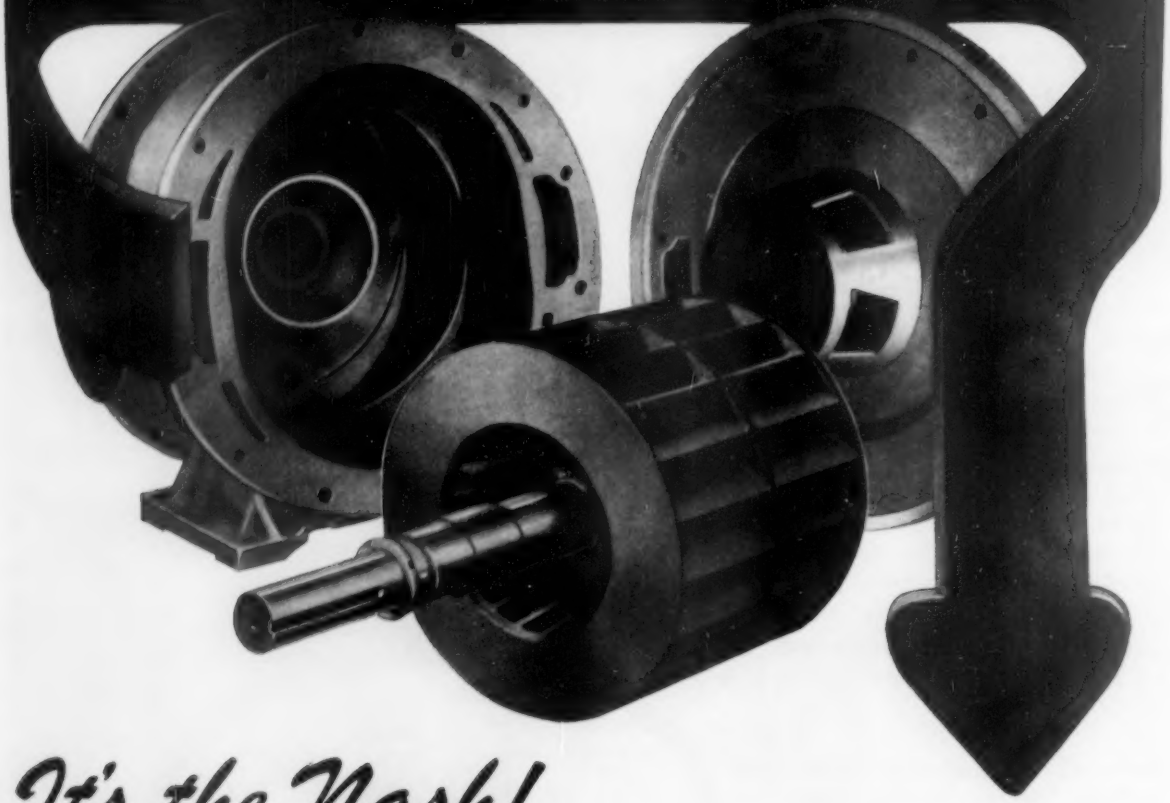


Amercoat CORPORATION

Dept. C,
4809 Firestone Blvd.,
South Gate, California

EVANSTON, ILL. • KENILWORTH, N.J. • JACKSONVILLE, FLA. • HOUSTON, TEX.

This Simple Compressor Meets the Complex Needs of a Changing Petroleum Industry



It's the Nash!

Here is a compressor presenting advantages found in no other device. Nash Compressors have only one moving part, rotating without metallic contact with the pump casing. No internal lubrication is required. Yet they produce 75 lbs. pressure in a single stage, with capacities to 6 million cu. ft. per day in a single structure.

There are no valves, gears, pistons, sliding vanes, or other complicated wearing parts in a Nash. Compression is secured by an entirely different principle of operation. Because of this, gas pumping problems difficult with ordinary pumps are often easily handled by the Nash. For example, Nash Pumps are standard equipment in the Synthetic Rubber Industry, where they have met the needs of new and difficult processes.

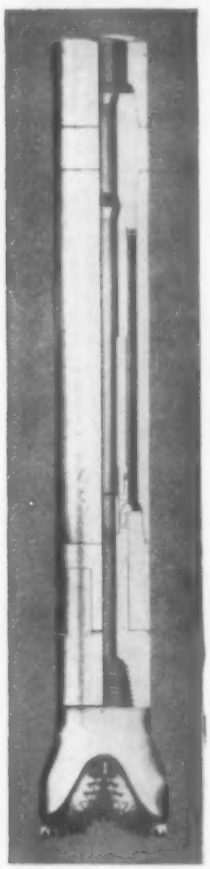
Nash Compressors are compact and save space. They run without vibration, and compression is without pulsation. They maintain original performance over long periods. Service is assured by a nationwide net-work of Engineering Service offices. Instructive bulletin shows how they operate. Write for it.

- One moving part.
- No internal wearing parts.
- No valves, pistons, or sliding vanes.
- No internal lubrication.
- Low maintenance.
- Slugs of liquid entering pump do no harm.
- Non-pulsating pressure.
- Saves floor space.
- 75 pounds in a single stage.

NASH ENGINEERING COMPANY
311 WILSON, SO. NORWALK, CONN.

announcing the

NEW JOHNSTON HYDRAULIC hole caliper



Receiving sub in drilling position — positioned between drill collar and bit. Caliper instrument is dropped or pumped down just prior to pulling out of hole.

Gives you a NEW HIGH in accurate caliper logging — with a NEW LOW in rig time

This latest development of Johnston Testers, Inc., gives continuous measurement and recording of hole diameter, and eliminates drilling-rig down time.

Saves rig time because it eliminates time lost in rigging up and running wire line caliper.

The instrument is dropped into the drill pipe just before removing pipe. It measures and records as drill pipe is removed from the hole.

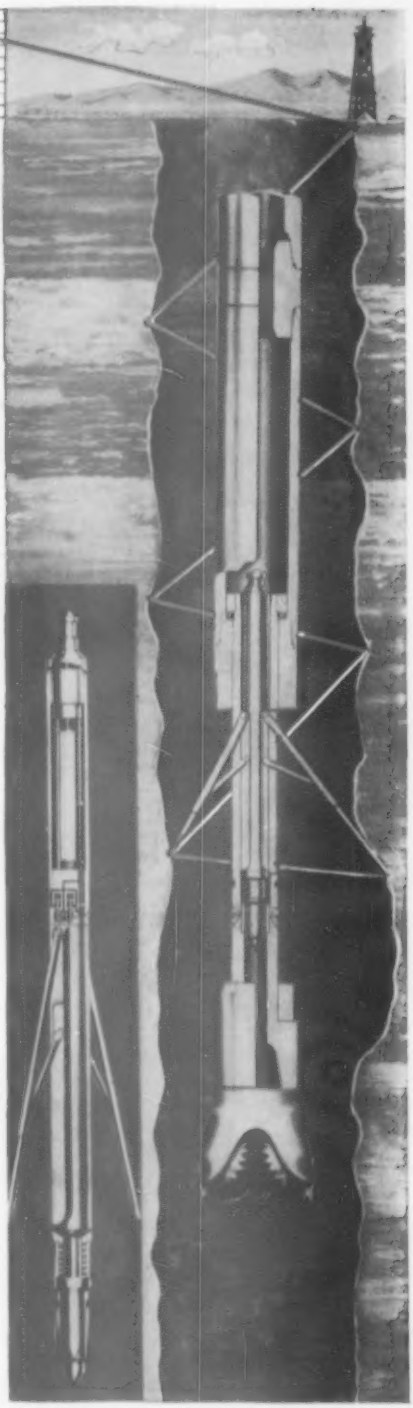
Logs while drill pipe is in the hole, free to circulate at any point. No delay or difficulty in crooked or directionally drilled holes.

Accuracy is assured because the Caliper is completely hydraulic, with integrated measuring arms that constantly measure maximum hole diameter, whether the Caliper is centralized in the hole or not.

Two-speed recording gives either a detail or a normal chart.

Let us give you all the facts about the new Johnston Hydraulic Hole Caliper and its many uses where extremely accurate measurement and recording of subsurface conditions are required.

WRITE OR CALL FOR FREE FOLDER



This is the Caliper Instrument with cutaway view of the hydraulic system, clock and chart compartment.

Receiving sub is open and Caliper in measuring position. Caliper instrument unlocks sub as it is indexed in place.

JOHNSTON TESTERS

first in drill stem testing

HOUSTON, TEXAS

HC 541

LOS ANGELES, CALIF. • CALGARY, CAN.

FORMATION AND CASING TESTING — JOHNSTON

FIRE TRAINING SCHOOL. Here at Marinette your key plant personnel will receive special training in the proper use of every type of fire equipment. They will learn the basic techniques for fighting every kind of fire. This is the best equipped private fire training school in the nation.

There is no need to accept less than Ansul's complete fire protection program!

TRAINING DEMONSTRATIONS. Our fire fighting experts provide training in the use of Ansul equipment at your plant.

ALL ANSUL EQUIPMENT is backed by a five year warranty, your assurance of fast, effective fire protection.

Experience can be a grim teacher. It has taught many a businessman that you need a *complete* fire protection program to guard against ruinous fire damage. You need *fast, effective equipment,* plus *trained personnel* to man that equipment. Ansul offers *both* and at no extra cost. Get in touch with the Ansul man, he has the story about *complete* fire protection.

Call the Ansul Man!

Get in touch with your local Ansul man through the "yellow pages" or write ANSUL CHEMICAL COMPANY, Dept. F-92, Fire Equipment Division, Marinette, Wisc. Write Ansul for your copy of new Fire Equipment Catalog.

ANSUL

NOW — BLOCKS, TABLES and RIGS by UNIT

UNIT'S NEW TRAVELING BLOCK

- Available as block hook combination or block only.
- Models from 100 to 300 Ton capacities.
- Low center of gravity for straight running—free falling operation.
- Streamlined for safe operation and easy handling.
- Rolled forged seamless steel, flame hardened sheave rims.

UNIT'S DRAW WORKS

- Choice of six models for economical drilling from 1,500 to 16,000 feet.
- Choice of engine compounds . . . in line or sectional (swinging type).
- Choice of drives — mechanical, fluid coupling or hydraulic torque converter.
- Compactly designed for ease of handling, transporting, and rigging up.

UNIT'S NEW ROTARY MACHINES

- Available in two sizes, three models for all drilling depths.
- Dynamically balanced table for smoother maintenance-free operation.
- Really Mud Proof. Labyrinth seals and flingers prevent mud intrusions.
- All square design for ease of flooring up.
- 32 table Locking positions.

UNIT

UNIT RIG

UNIT RIG & EQUIPMENT CO.

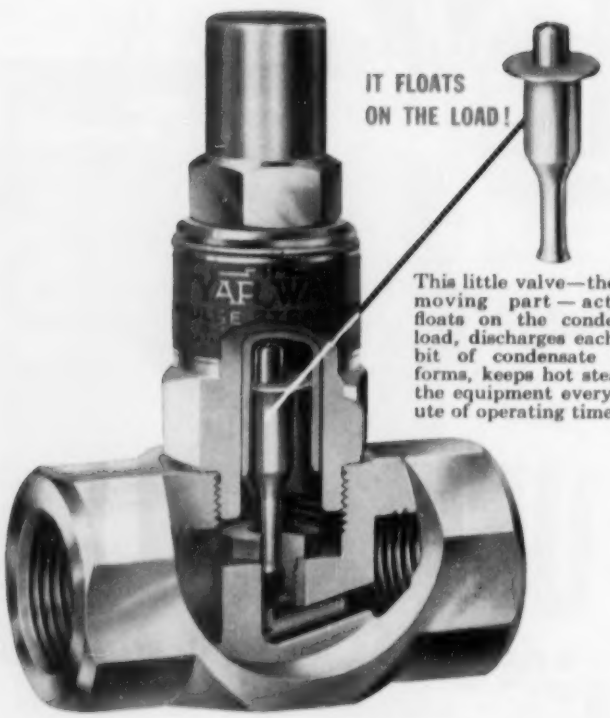
TULSA, OKLAHOMA, U. S. A.

A-549

EXPORT SALES—MID-CONTINENT SUPPLY COMPANY
45 Rockefeller Plaza, New York 20, New York
Cable — MIDUNITRIG

UNIT RIG & EQUIPMENT COMPANY PRODUCTS
SOLD THROUGH LEADING SUPPLY COMPANIES
IN THE U.S.A. AND CANADA

3000 impulses help keep mid-west refinery "on stream"



This little valve—the only moving part—actually floats on the condensate load, discharges each tiny bit of condensate as it forms, keeps hot steam in the equipment every minute of operating time.

THIS big refinery at Lawrenceville, Ill.—like a lot of other important refineries — uses Yarway Impulse Steam Traps.

Over 3000 Yarway Impulse Traps are installed on tracer lines and for draining steam headers.

Popular features of the Yarway Impulse Steam Trap are its ability to get equipment *hot in a hurry*—and keep it hot! . . . also its small, handy size—fits in easily in any location; its stainless steel body and working parts; quick installation; easy maintenance; low initial cost.

Another advantage—IMMEDIATE DELIVERY from 250 local distributors, plus quick service from nearby Yarway field engineers.

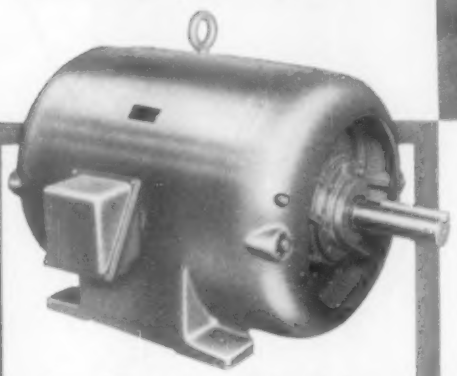
More than 1,000,000 Yarway Impulse Steam Traps have been sold. For a free Steam Trap Selector, write . . .

YARNALL-WARING COMPANY
136 Mermaid Ave., Philadelphia 18, Pa.

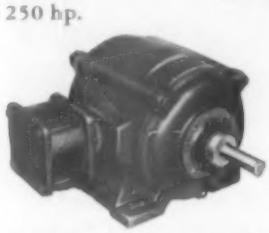
YARWAY® impulse® steam trap

Wagner®
ELECTRIC MOTORS
...the choice of leaders in industry

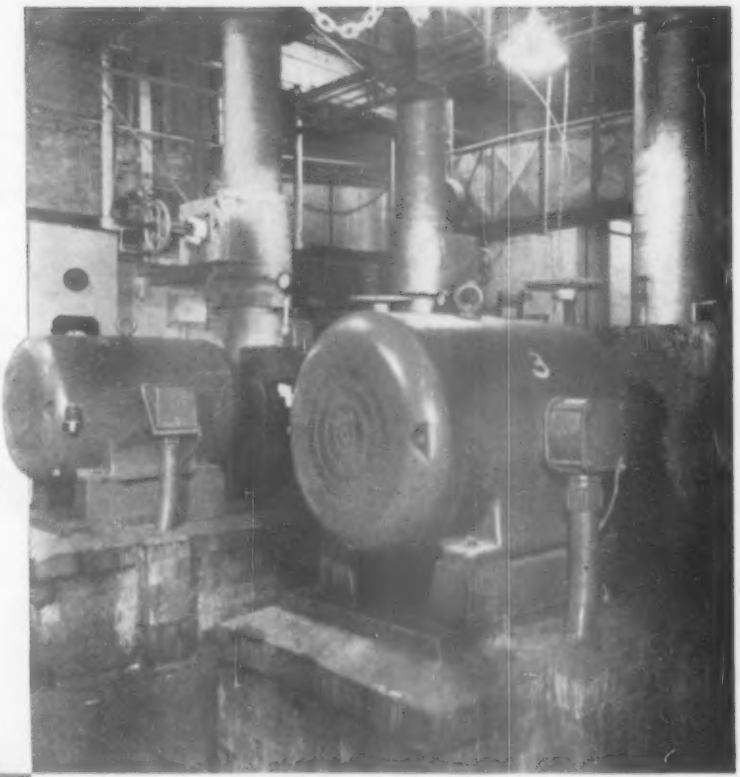
use WAGNER Cast Iron Frame Motors for *EXTRA PROTECTION* in corrosive atmospheres



Type EP, totally-enclosed fan-cooled. Available in ratings from 2 to 250 hp.



Type JP, non-ventilated. Explosion-proof. ½ through 1½ hp.



These 150 hp Wagner Cast Iron Frame Motors drive brine pumps in an acid area at Celanese Corporation's Rock Hill, S. C. plant.

If the motors in your plant are subjected to corrosive fumes and liquids, Wagner Cast Iron Frame Motors will provide the *extra protection* you need.

These stock motors are totally-enclosed in corrosion-resistant cast iron. All parts exposed to the atmosphere are fabricated of corrosion-resistant material—even the nameplate. Features include completely protected laminations . . . special varnish treated windings . . . a running shaft seal.

Wagner Cast Iron Frame Motors are available in fan-cooled standard and explosion-proof types in ratings from 2 to 250 hp, and in non-ventilated standard and explosion-proof types in ratings from ½ through 1½ hp. Wagner Bulletin MU-132 gives complete information.

A skilled Wagner engineer will help you select the Wagner Motor to meet your most exacting specifications. Call the nearest of our 32 branch offices, or write us.

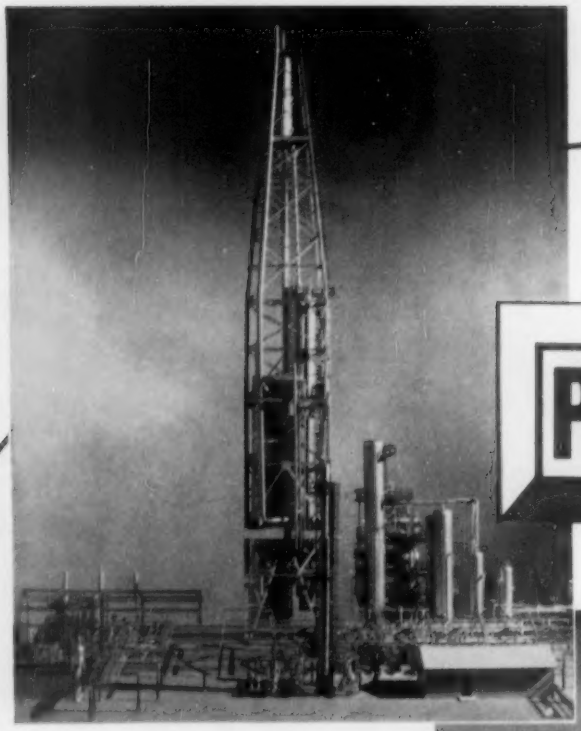
Wagner Electric Corporation
EST. 1891

WAGNER ELECTRIC CORPORATION
6389 PLYMOUTH AVE., ST. LOUIS 14, MO., U.S.A.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

ELECTRIC MOTORS
TRANSFORMERS
INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

M55-7



PARSONS

OPERATION TURKEY

A complete petroleum refinery, including a steam-electric power plant, has been designed and engineered, and is now under construction for the Republic of Turkey by The Ralph M. Parsons Company.

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OIL MEANS PROSPERITY FOR MORE PEOPLE

New industries develop... more jobs are created... salaries and standards of living are higher for more people. In paving the way for new oil discoveries, Schlumberger works for approximately 4,000 oil companies and independent operators in the course of a year. There are more than 100 Schlumberger service outlets in the United States and Canada.

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Schlumberger Well Surveying Corp. • Houston, Texas

IMPORTANT INSURANCE

A TRULY efficient safety relief valve for pressure storage tanks must remain tightly closed at all pressures within the working range, yet must open without fail whenever internal tank pressure tends to exceed the working limit. The Shand & Jurs Pilot Operated Safety Valves meet these specifications to a "T." They provide the important insurance against property damage and personnel hazards caused by failures due to excessive internal tank pressures.

The S&J Pilot Operated Safety Valve, Fig. ST-5000, incorporates a special seal on the main valve pallet preventing any leakage prior to full opening. It operates exactly at the set pressure with a minimum of blowdown, requiring no accumulation of pressure above this setting for full opening. A special "peeling action" on valve seating surfaces minimizes interference by freezing or sticky foreign substances. Should the diaphragms be damaged or ruptured, the valve will continue to operate at a lower pressure. Available in 4" and 6" sizes for pressure ranges of 1 to 10 pounds.

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Whessoe, Ltd., Works: Darlington, County Durham

Test shows Aluminum pipe for oil, gas, water

Saves 90%

on installation cost . . .

3 Miles of Aluminum Oil Country Pipe Carried On One Truckload

A recent demonstration showed that aluminum pipe for temporary oil, gas and water lines can be installed and picked up with one tenth the man hours required for steel pipe of comparable dimensions.

One mile of 2⅞" aluminum pipe was handled by three men and one truck. Average stringing and coupling time was 1½ hours and average uncoupling and loading time was also 1½ hours. A total of nine man hours, and a total truck time of three hours, were required for the mile test.

One prominent company with over 50 miles of aluminum oil country pipe in service states that to lay and pick up one mile of steel pipe of comparable dimensions on a temporary line, an average of 98 man hours would be required. Truck time, on the average, would be about six hours.

High grade systems combining rust-proof aluminum pipe with leak-proof couplings and fittings for service over a wide range of pressures are available.

Write Reynolds Metals Company, 2595 South Third Street, Louisville 1, Kentucky, for descriptive brochure, "Reynolds Aluminum Oil Country Pipe," giving further information and specifications of available pipe sizes.

See "Mister Peepers", starring Wally Cox, Sundays on NBC-TV

REYNOLDS ALUMINUM

MODERN DESIGN HAS ALUMINUM IN MIND

The best way to get the most for your tube steel dollar: *Ask the experts!*

This month's report is on: **2% CR.-MO.**

Has intermediate corrosion resistance in combination with good creep strength and fair resistance to oxidation. For use at temperatures up to 1200°F. in cracking coils, reforming units, heat exchangers, vapor line and hot oil piping, and return-bend forgings for oil heaters.

ONE OF 24 TIMKEN HIGH TEMPERATURE STEELS

Carbon	Sicromo 2	Sicromo 5S	18-8Ti
Carbon-Mo.	Sicromo 2½	Sicromo 5MS	16-13-3
DM-2	2½% Cr.-1% Mo.	Sicromo 7	25-20
Silmo	Sicromo 3	Sicromo 9M	25-12*
DM	4-6% Cr.-Mo.	18-8 Stainless	35-15**
2% Cr.-Mo.	4-6% Cr.-Mo.-Ti.	18-8 Cb	16-25-6**

* *Available as seamless tubing on an experimental basis only.*
** *Not available as seamless tubing.*

THERE are probably several high temperature tube steels that will solve your heat, pressure, corrosion or oxidation problems. But there's only one that will give you the most for your tube steel dollar—the best life/cost ratio.

The best way to find it is to ask Timken Company metallurgists. They're recognized authorities on high temperature steels. With 23 years of experience behind them, they can help you select your best steel from 24 different analyses. You'll be sure of getting the most for your tube steel dollar. And you'll be assured of uniform quality in every tube because The Timken Company rigidly controls quality from melt shop through final inspection.

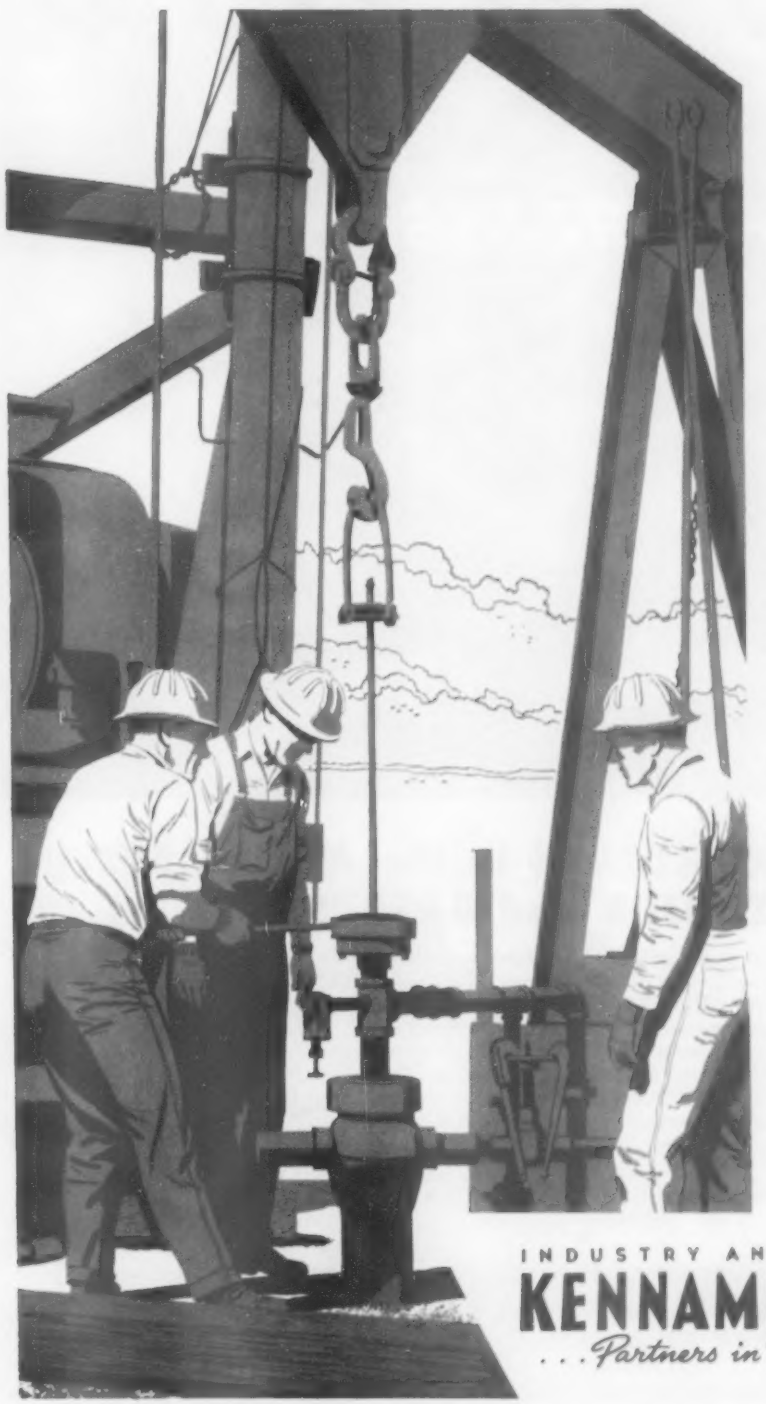
For help with your tube steel problems, *ask the experts!* The Timken Roller Bearing Company, Steel & Tube Division, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This photo shows final tube inspection—last of hundreds of rigid tests that help account for the uniform quality of Timken high temperature steels.

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

Kennametal* goes back down the hole after 448 days ...maximum life of previous valving—20 days



This West Texas producer pumped 168 barrels of oil a day from a well 2370 feet deep. Valve failure caused by sand abrasion of the balls and seats forced him to surface the pump every 14 to 20 days of operation.

After replacing the previous valving with Kennametal Balls and Seats, he got, at last report, 448 days of service before he pulled the pump—and this was for a problem other than valve wear. At that time, the Kennametal Balls and Seats were found to be in satisfactory condition and replaced in the cages. They are still on the job after having served over 22 times as long as previous balls and seats.

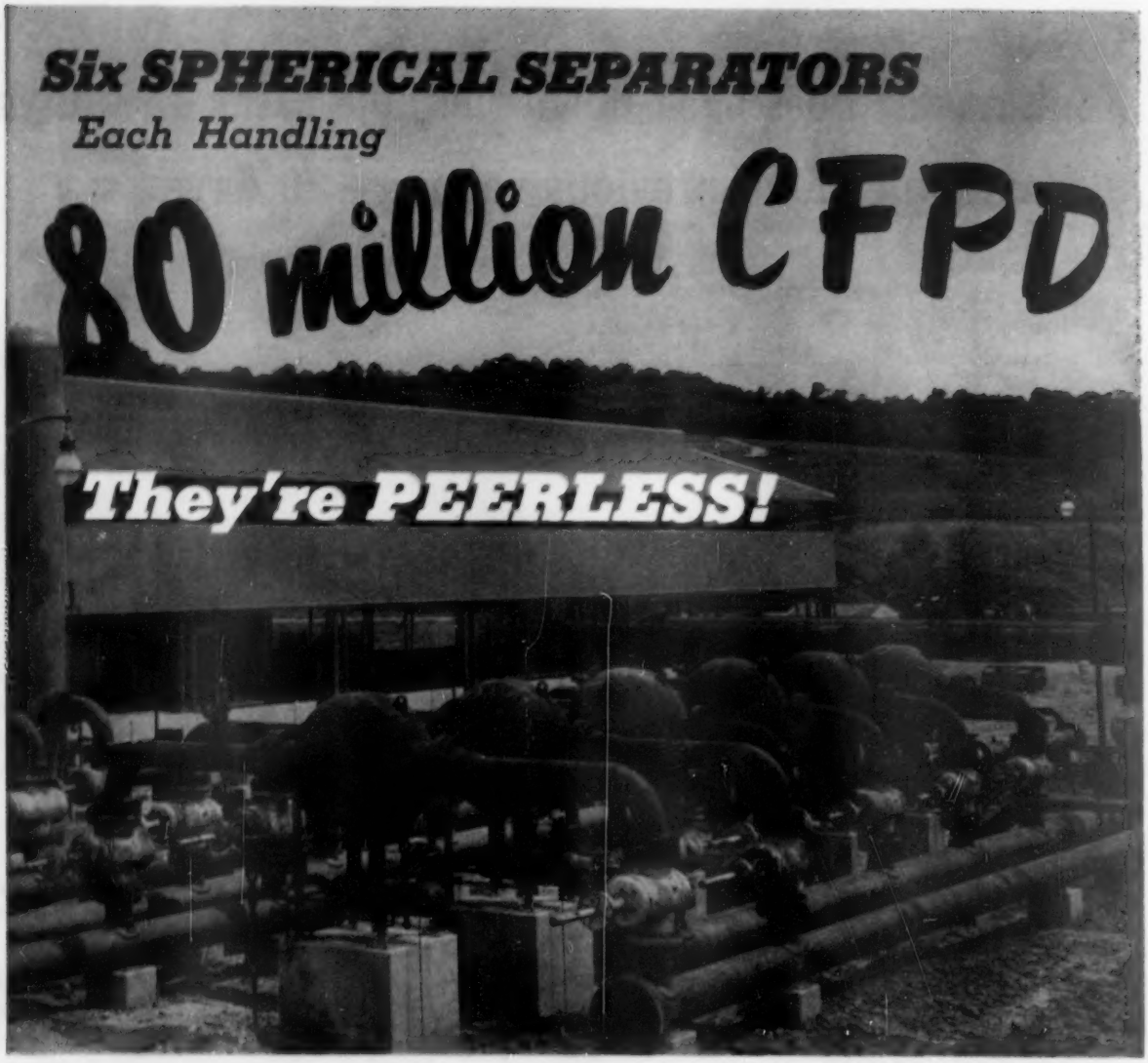
Figured in terms of the costs of string pulls, pump repairs and loss of production due to frequent valve failure in problem wells, it doesn't *cost* to use Kennametal, *it pays.*

Kennametal Sintered Carbide, API Balls and Seats are available at repair shops of most major pump manufacturers. Ask your service man to standardize on them. They'll cost you less in the long run.

KENNAMETAL INC., Latrobe, Pa.

* Registered Trademark

INDUSTRY AND
KENNAMETAL
. . . Partners in Progress



PEERLESS-*SPECIALISTS* in the *SEPARATION* of LIQUIDS and GASSES!

At a huge underground gas storage project in Pennsylvania, you'll find the SIX specially built PEERLESS SPHERICAL SEPARATORS, as pictured above. All compressed gas passes through these separators to prevent condensate from getting to the dehydration plant load and upsetting the schedule. These SIX PEERLESS SEPARATORS are good for 1,500 PSIG working pressure and are designed to pass 80 million CFPD each at 450 PSIG.

This is just another installation typical of the many applications of PEERLESS SEPARATION EQUIPMENT.

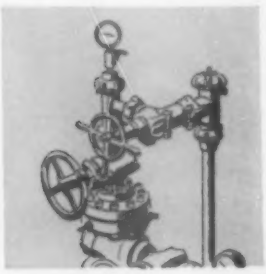
PEERLESS MFG. CO.

PEERLESS MANUFACTURING CO.

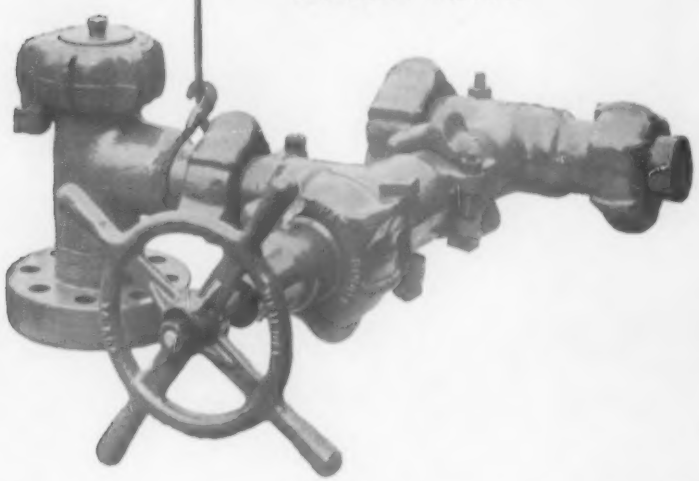
P. O. BOX 13165 ★ DALLAS, TEXAS ★ Dixon 8431

REPRESENTATIVES IN ALL PRINCIPAL CITIES

UNIBOLT FLOW MANIFOLDS



started a new trend — the fabrication of salvageable parts into a compact, strong, lightweight unit that provides everything necessary above the master valve



More and more operators are requesting their Christmas tree supplier to furnish UNIBOLT Flow Manifolds because they are lighter in weight, stronger, and more economical, and easier to maintain than ordinary flanged Christmas tree wings.

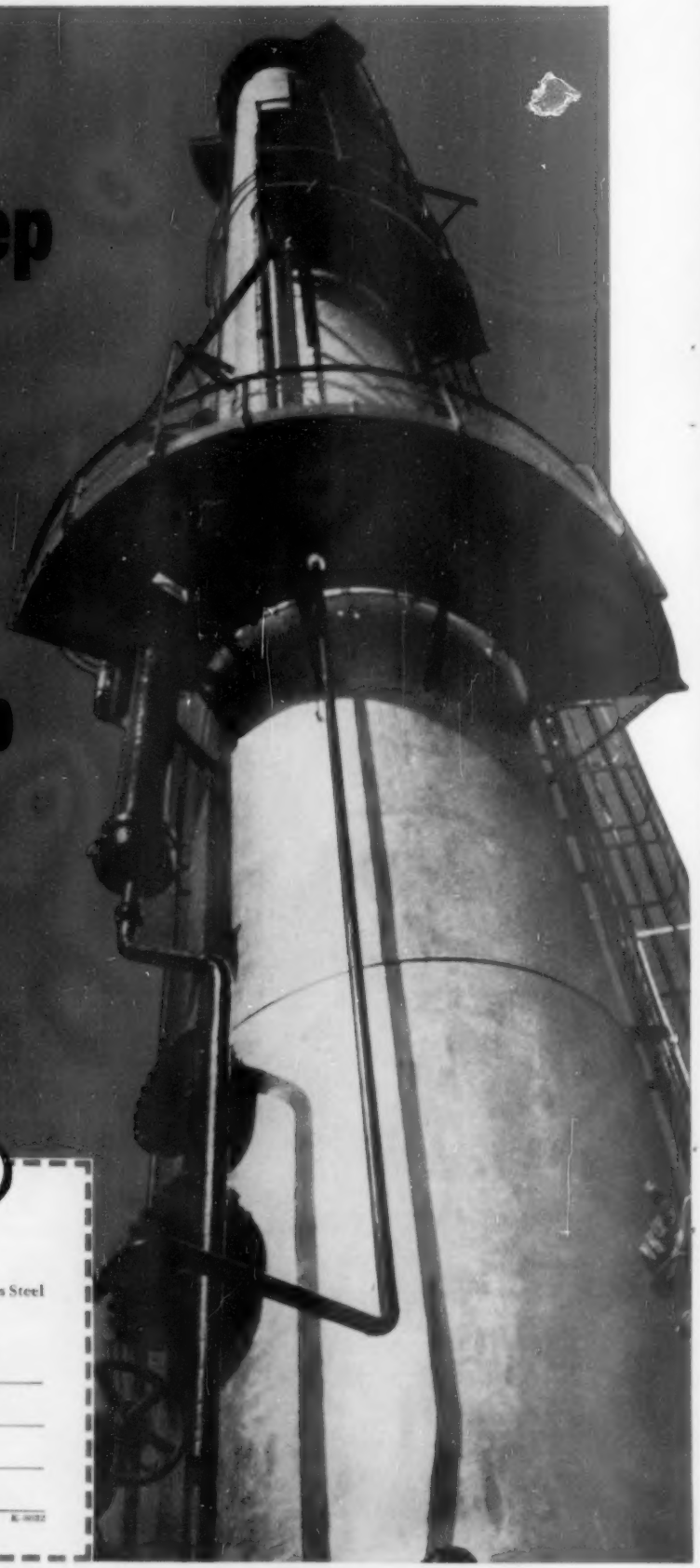
Employing standard UNIBOLT connections rather than flanges, the UNIBOLT Flow Manifold is many pounds lighter, yet the UNIBOLT design, which places more steel in shear, actually results in a higher factor of safety for the manifold.

The units of the manifold — UNIBOLT Tee or Cross, Adjustable Wing Valve, and Positive Choke Body — are pressure-tested as a unit and may be assembled in a number of combinations to best meet individual needs. They are furnished in regular forged steel or in stainless steel for corrosive wells — 6,000, 10,000 and 15,000 lbs. test. The manifold is completely salvageable.

THORNHILL CRAVER CO.

P. O. BOX 1184 HOUSTON, TEXAS

How to keep corrosion from chewing up a refinery



REPUBLIC STEEL

Republic Steel Corporation
3112 East 45th Street,
Cleveland 27, Ohio

Please send me more information on:

☐ Enduro Stainless Steels
☐ ELECTRUNITE Stainless Steel Heat Exchanger Tubes
☐ Republic Casing
☐ Republic Alloy Studs

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

K-1032

Make sure your equipment is made of Republic Enduro Stainless Steel. That includes trays, bubble caps, heat exchanger tubes, fractionating towers, vapor risers and valves. And this is only a partial list of equipment where Enduro Stainless Steel fights corrosion as does no other commercial metal.

This versatile metal discourages coking and fouling. Enduro is solid stainless steel, with no applied surface to crack, chip, peel or flake. And that means easier cleaning, less frequent cleaning, less down-time during turn-arounds.

Enduro takes the combination of high pressures and temperatures with ease. It saves weight and trims bulk, because thinner sections can be used with no loss of strength. And it keeps this strength at both ends of the thermometer.

Republic has pioneered the wide use of stainless and heat-resisting steels in refineries for more than 30 years. We will be glad to share our information with you. And we can put you in touch with refinery suppliers who make the equipment you need, engineered to your specific applications. Just mail the coupon and Republic will do the rest.

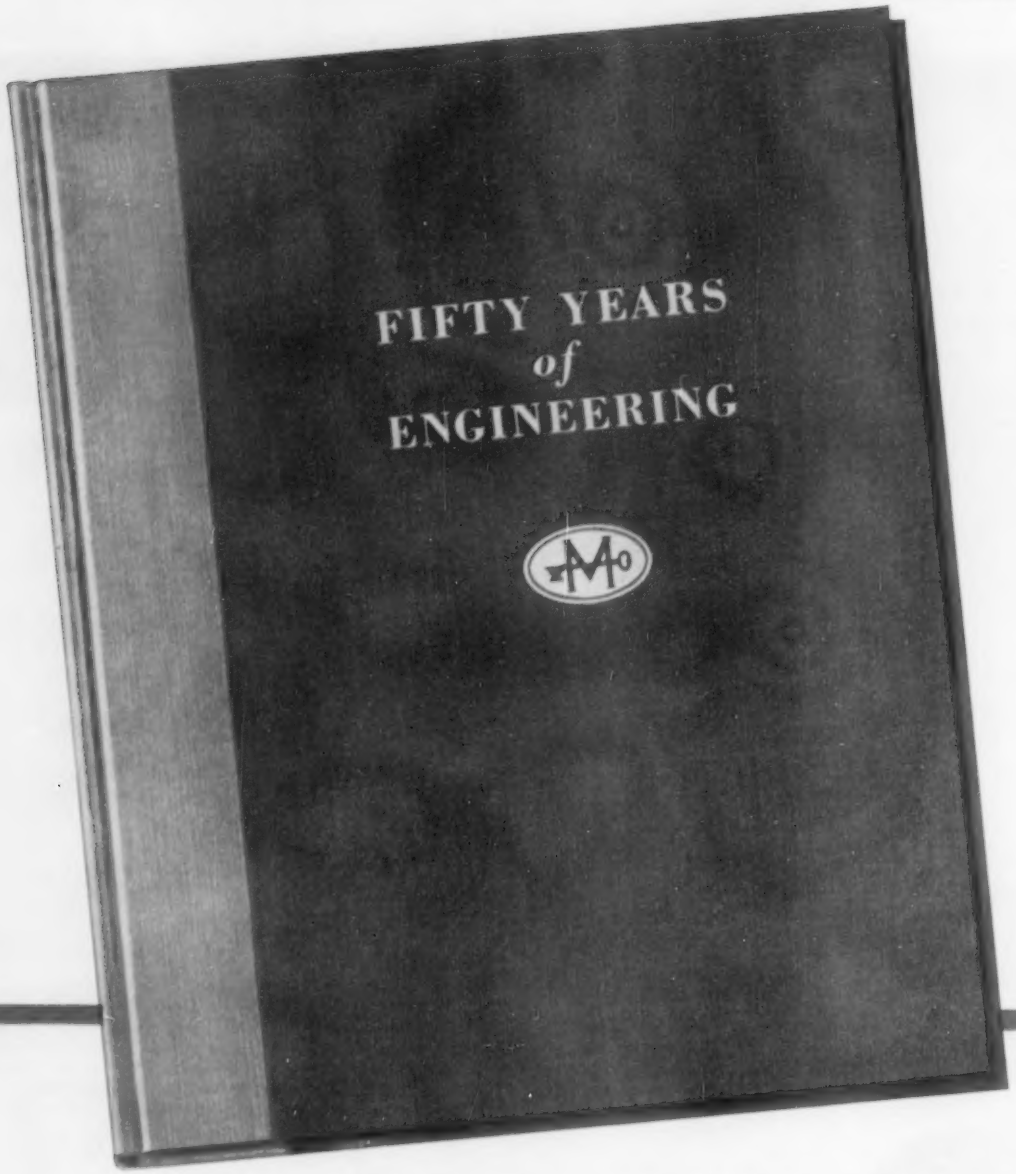
REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products

CORROSION IN STAINLESS STEEL HEAT EXCHANGERS IS CHECKED by Republic ELECTRUNITE Stainless Steel Heat Exchanger Tubes. Longer service life is the result of the electric weld method of producing ELECTRUNITE Tubing plus close quality control. Among refineries using ELECTRUNITE Heat Exchanger Tubes are: The Standard Oil Co. (Ohio); Gulf Refining Co., Sinclair Refining Co.; Deep Rock Oil Corporation; Crown Central Petroleum Corp.

CORROSION, HIGH TEMPERATURE, HIGH PRESSURES, the three most common causes of stud failure, are licked by tough, heavy-duty Republic Alloy Steel Studs. Even under extreme temperatures, Republic Alloy Steels provide toughness and strength. Resist corrosion, too. And they get top holding power, resistance to wear from clean, accurate threads. Maintenance is easy. Republic Alloy Studs are easy to tighten, easy to back off.

IN PRODUCING AS WELL AS REFINING, you can always figure on highest quality when you specify Republic Casing and Tubing. Like all Republic products, these are manufactured by use of the latest techniques and quality controls. More than 25 years' service in oil fields all over the world has proved Republic strings dependable, and economical. You can order both Normalized Electric Weld (in grades H-40 and J-55) and Seamless (grades J-55 and N-80) from your oil country distributor.



THE YEAR 1955 marks the Fiftieth Anniversary of the founding of Arthur G. McKee & Company.

Since 1905 this company has had a continuous, successful record of fifty years of engineering, designing, building in every quarter of the globe—fifty years of accumulating knowledge and experience—fifty years of building an organization with the specialized abilities, the scope and resources to undertake projects of any size in any location.

The sound, practical engineering methods and thorough, painstaking construction techniques developed in a half-century of McKee history can be invaluable to you on your new plant project, as they have been to hundreds of McKee clients in the past.

50th ANNIVERSARY

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Arthur G. McKee & Company • Engineers and Contractors

Headquarters: McKee Building • 2300 Chester Avenue • Cleveland 1, Ohio
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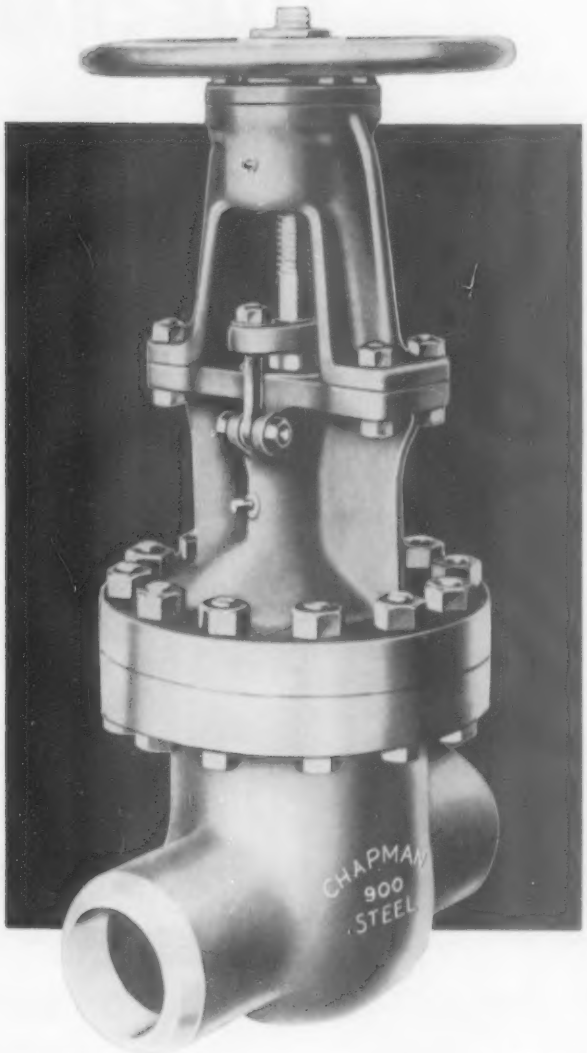
British Representatives of Metals Division: Head, Wrightson & Co., Limited
Canada: Arthur G. McKee & Company of Canada, Ltd., 372 Bay St., Toronto



Special Qualities at Standard Prices
...in CHAPMAN Steel Valves

When you buy Chapman Steel Valves, you buy dependable operation and low maintenance cost — you can select steels to meet your specifications from over a dozen alloys made in Chapman's own steel foundry, under rigid scientific supervision.

When your valves are Chapman, you're sure they seat tightly and accurately, without jamming, chattering or wearing excessively. Close tolerances mean long service and little maintenance.

The Chapman Steel Valve line is complete — gates, globes, and checks for all pressure classes . . . 150, 300, 400, 600, 900 and 1500 pounds, and for a temperature range of −150°F to 1000°F. Valves are supplied with bolted or welded body and bonnet joints and flanged or welding ends to meet service requirements.

Chapman's long experience and mass production mean economies. Quality is unsurpassed. So it pays to see Chapman first for every steel valve requirement . . . standard or special, gate, globe, angle or check. Chapman Steel Valves equal or exceed A.P.I. standards in every range. Write for Catalog No. 20.

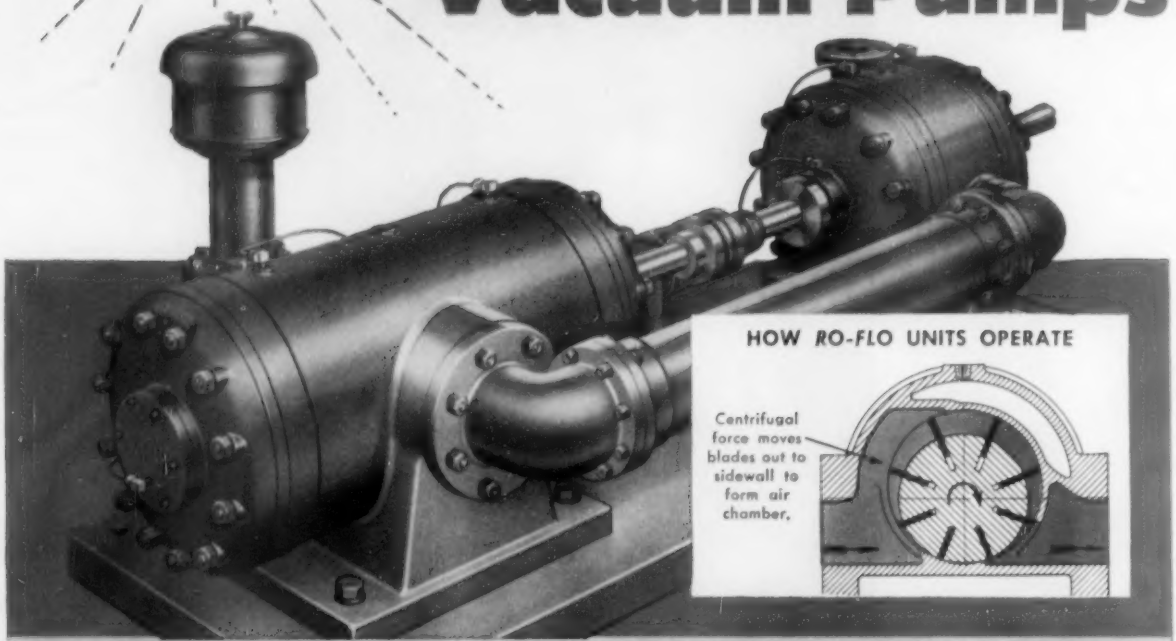
The CHAPMAN Valve Manufacturing Co.
INDIAN ORCHARD, MASSACHUSETTS

ALLIS-CHALMERS

NEW

100-lb Compressors

0.3-in. Mercury Absolute Vacuum Pumps



FOR SHOP AIR • DRILLING • GAS HANDLING • VACUUM PUMPING

Now—the *Ro-Flo* line is extended to include high pressure as well as low pressure units to give you three important advantages:

Constant efficiency — Automatic compensation for wear is inherent in *Ro-Flo* design. During operation, rotor blades slide against the sidewall to form air cells. Any blade wear from this action is compensated for by the rotating force which holds blades in contact with the cylinder.

Simple foundation requirements— The smooth rotation of the *Ro-Flo* unit cuts vibration and eliminates need for heavy, expensive foundations.

Low maintenance — Shock and vibration, inherent in reciprocating machines, is eliminated. This cuts maintenance.

Two-stage *Ro-Flo* compressors can be furnished in any of 12 sizes to handle from approximately 250 to 1800 cfm at pressures from 65 to 125 pounds gauge. Vacuum pumps furnished from 200 to 5040 cfm at 29.7 inches Hg vacuum, with shut-off of 29.9 inches Hg, referred, or better. Single-stage units are built for pressures up to 50 pounds gauge, 65 pounds absolute. Single-stage pumps for vacuums up to 28 inches Hg referred.

A-4569

GET INFORMATION

Call your nearby A-C district office, or write Allis-Chalmers, Milwaukee 1, Wisconsin.

Ro-Flo is an Allis-Chalmers trademark.

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

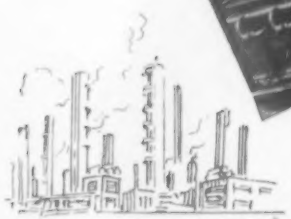
THIS 400,000 Pounds per HOUR

Vogt

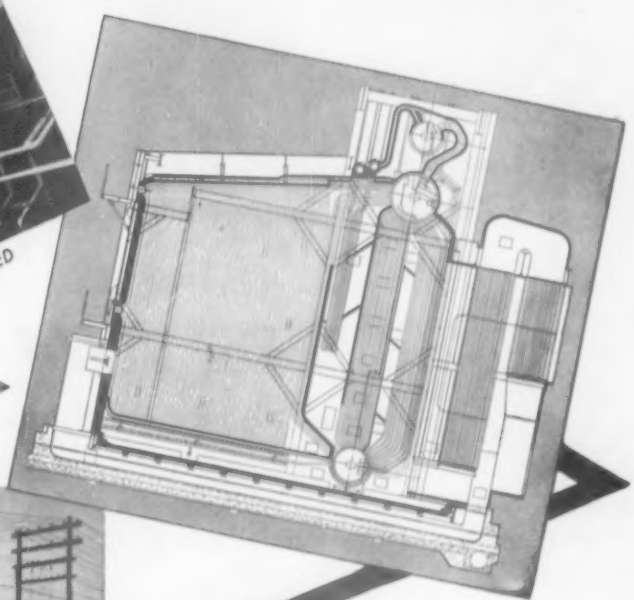
STEAM GENERATOR

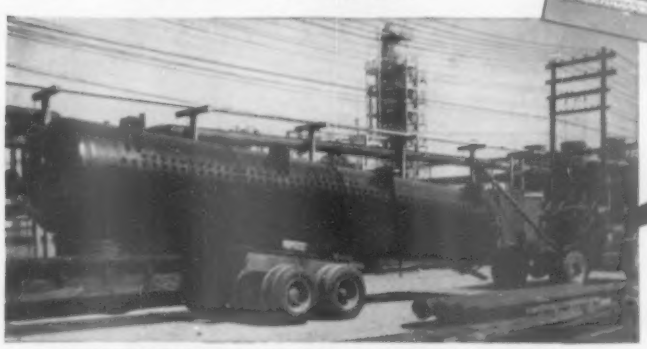
Gives Top Performance in a Leading Texas Petroleum Refinery

VIEW OF THE COMPLETED STEAM GENERATOR



RIGHT →
LONGITUDINAL SECTION THROUGH THE UNIT.





6'-6" DIAMETER x 37'-0" LONG STEAM DRUM BEING TRANSPORTED TO THE ERECTION SITE DURING INSTALLATION.

PRINCIPAL DATA

400,000 pounds per hour capacity.

Fusion welded steam and water drums designed for 700 lbs. S.W.P.

Superheater delivers steam at 750°F. total temperature.

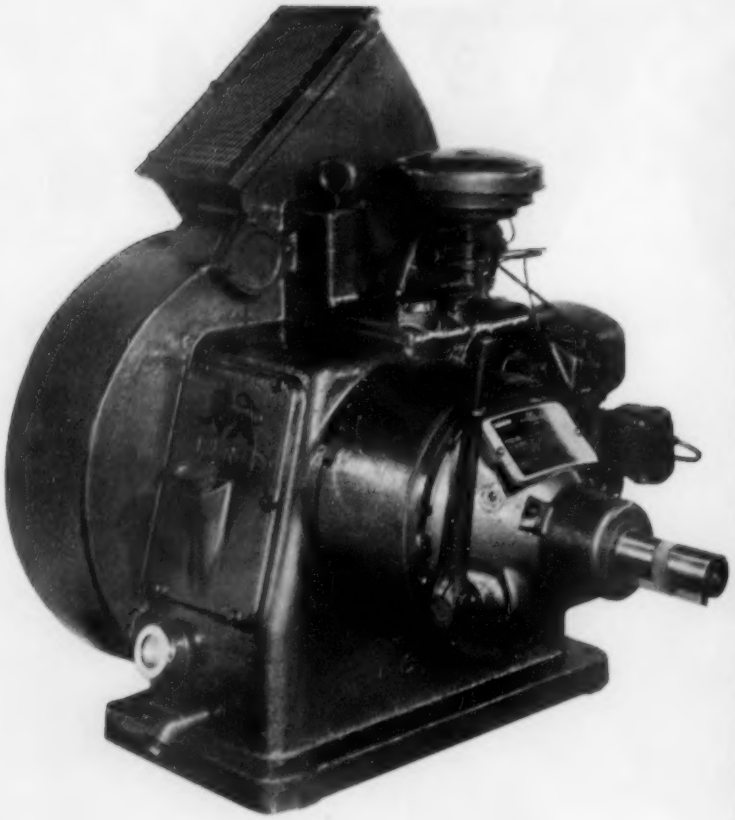
Water cooled furnace.

Burners for Oil and Acid Sludge fuel.

Vogt builds a complete line of bent tube steam generators designed to burn solid, liquid, or gaseous fuels to meet specific operating conditions. Write for bulletins.

HENRY VOGT MACHINE CO., LOUISVILLE 10, KY.

BRANCH OFFICES: New York, Philadelphia, Chicago, Cleveland, St. Louis, Dallas, Charleston, W. Va.



New LeRoi A114 Pumping Engine

A single-cylinder, valve-in-head engine with 114 cu. in. displacement, built specifically to give you economical operation with little attention.

Here it is — an engine that can pump more oil than any other engine of equal displacement. You can run it two weeks at a time without inspection, because the patented "vaporizing condensing" cooling system seldom needs make-up water. Moreover, a generous crankcase permits long intervals between oil changes, and there are no grease fittings, belts, or other accessories to need attention.

Performance is only half of the A114 story— the other half is dependability. Here are a few of the features that give the A114 its stamina:

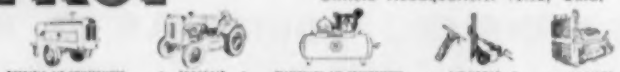
The A114 operates on natural gas or LPG.

Get all the facts about this new 14.5 hp pumping engine from your supply house or your Le Roi distributor. Or, write for our latest bulletin E-8.

LE ROI *Division of Westinghouse Air Brake Co.*

Milwaukee 14, Wisconsin

Oilfield Headquarters: Tulsa, Okla.



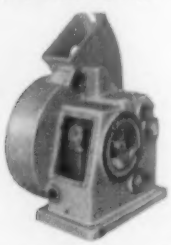
PORTABLE AIR COMPRESSORS • TRACTAIR • STATIONARY AIR COMPRESSORS • AIR TOOLS • ENGINES

P-128

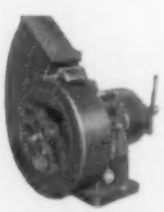
Two extra large flywheels provide generous WR2 values for smooth, constant-speed pumping even with unbalanced loads.

Valve-in-head design produces maximum power with minimum fuel consumption. Short stroke design reduces piston speed and lessens cylinder wear.

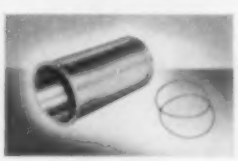
Short, counter-balanced crankshaft, 3" in diameter, has extreme overlap between crank pin and main bearing journals for added strength and rigidity.



Heavily constructed and internally ribbed, integral crankcase and base eliminate any possibility of distortion.

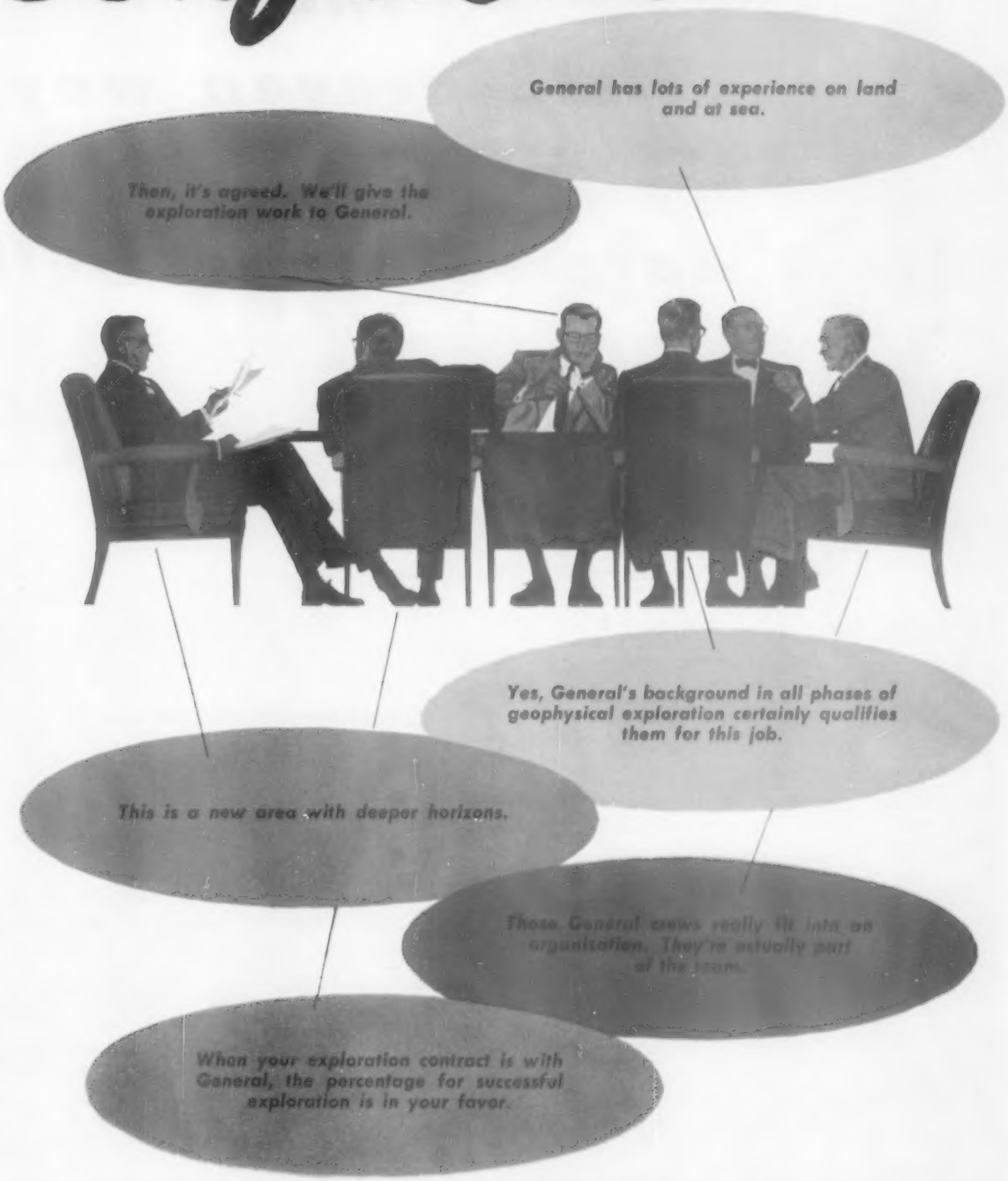


One-piece fan and flywheel is totally enclosed in a specially built air duct. No fan or belt to maintain or replace.



Removable, wet-cylinder sleeves assure easy, low-cost replacement of cylinder wearing surface.

Confidence


General has lots of experience on land and at sea.
Then, it's agreed. We'll give the exploration work to General.
Yes, General's background in all phases of geophysical exploration certainly qualifies them for this job.
This is a new area with deeper horizons.
Those General crews really fit into an organization. They're actually part of the team.
When your exploration contract is with General, the percentage for successful exploration is in your favor.

General GEOPHYSICAL COMPANY
GULF BUILDING • HOUSTON, TEXAS

The field-proven way to stimulate water-blocked wells

Looking for a simple, quick-payout way to stimulate wells that have been damaged by water?

ATPET 931 is your best bet!

- *A product of Atlas Powder Company, leading producer of surface active agents.*
- *Applied by a technique* developed by Stanolind Oil & Gas Company.*

Thoroughly field tested—Many months of field and laboratory testing proved the exceptional effectiveness of ATPET 931 before the product was announced. Since then, treatments have been applied to more than 400 wells . . . with an unusually high percentage of success.

Simple process—From 10 to 50 gallons of ATPET 931, mixed in 1000 to 5000 gallons of field crude (1%), are pumped into the formation. Due to its superior ability to reduce oil-water interfacial tension, ATPET 931 breaks down the water barrier and allows normal oil flow.

Normal well-servicing equipment is used—special high pressure injection equipment and high injection rates are unnecessary.

Quick payout—Cost of chemicals is low . . . pumping costs are minimum. In 90 test cases payout time for successful treatments averaged only *six days*—increased production by 32 BOPD per well.

*Patent applied for.

ATPET: Reg. U.S. Pat. Off.

A Typical Success Story

Clinton field, Tex.:* Well I, producing from the Marginulina sand, had been repaired by cleaning out the wellbore, squeezing perforations to shut out water, drilling out and reperforating. Following workover, no appreciable production could be obtained. Sand was washed out of the hole and the well squeezed with 200 bbl. of oil. No production could be obtained after two days' swabbing. The well was then squeezed with 2,000 gal. of crude oil containing 20 gal. of ATPET 931. Two days' swabbing raised the fluid level to 2,300 ft. Sand was washed out again and the well flowed 68 bbl. wash oil in 12 hours. Later, on a repotential test, the well flowed 116 bbl. oil and 3 BWPD with a GOR of 159.

The water-block in this well is believed to have been caused in part by the production of water and mud prior to repairs and in part by cement and mud filtrate lost to the sand during repairs. Some mixed wettability characteristics have been observed in this sand during laboratory tests.

*Published in Journal of Petroleum Technology, Nov., 1954.

Outstanding characteristics

- Reduces interfacial tension practically to zero.
- Non-ionic—effective even against brines and acids.
- Does not "plate out" on rock surfaces.
- Readily soluble in oil.
- Safe for personnel to handle.

For a reprint of "A low cost method of Production Stimulation," by A. W. Garst, Stanolind Oil & Gas Company, or additional technical information, write to Atlas Powder Co., Wilmington, Delaware, or one of the following field offices:

HOUSTON, TEXAS
3272 Westheimer Road
Justin 5561

CHICAGO, ILLINOIS
135 S. LaSalle Street
Franklin 2-9530

LOS ANGELES, CALIFORNIA
411 West Fifth Street
Michigan 8896

Statements concerning the use of Atlas products are not to be construed as recommending the infringement of any patent, and no liability for infringement arising out of any such use is assumed.

CHEMICALS DEPARTMENT
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BRANTFORD, CANADA

Maloney-Crawford VERTICOLD Provides Benefit of COLD SEPARATION at LOW INITIAL INVESTMENT

DON'T OVERBUY LET M-C HELP YOU DECIDE WHETHER VERTICOLD WILL HANDLE YOUR JOB

Verticold is a simplified Low Temperature Separator ideal for wells of small flow rate and of medium pressure. Its features are:

1. **Only 2 controls plus choke—eliminates costly maintenance and shut down.**
2. **Recoveries comparable to larger, more complex cold separator.**
3. **Prefabricated piping with unibolt connections eliminates necessity of skid.**
4. **Can be hooked up in 30 minutes.**
5. **Will dehydrate gas if sufficient pressure drop available.**
6. **If free water not a problem the expansion vessel can be installed without first stage—resulting in very inexpensive cold separator.**
7. **Can be installed in conjunction with a heat exchanger for still greater distillate recovery.**
8. **Continuous operation without fear of freezing, due to hydrates.**

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MALONEY-CRAWFORD TANK & MANUFACTURING CO.

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TEXAS PANHANDLE REPRESENTATIVE: Atlas Tank Company, Pampa, Texas

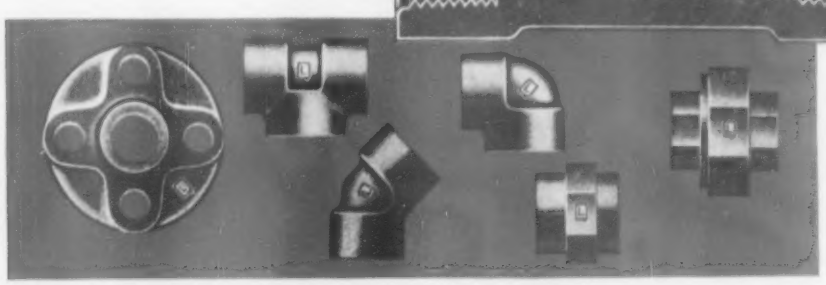
LUNCOR PVC VALVES REPLACE HIGH-ALLOY VALVES

Also Replace Valves Lined With Glass, Porcelain, Stoneware, Hard Rubber At Substantial Savings

LUNCOR is the first all-molded PVC valve designed and engineered by a valve manufacturer. LUNCOR PVC is a strong, rigid type of unplasticized polyvinyl chloride. The valve design has been created to take full advantage of the properties of PVC. LUNCOR PVC can be molded to precise tolerances and is remarkably corrosion-resistant, odorless, tasteless, non-toxic, non-porous, non-contaminating, and weighs only one-sixth as much as metal. The new valve, with its full line of fittings, permits ready installation of complete plastic piping systems.

Every part is made of all molded LUNCOR PVC . . . body, bonnet, disc, stem, and handwheel. Packing is self-lubricating Teflon.

FIG. 2600
125 WP
140°F.



LUNCOR FITTINGS

The complete line of fittings which complements the new LUNCOR Valve includes: caps, couplings, plugs, unions, reducing bushings, flanges, elbows, and tees. LUNCOR Fittings are made of the same high-quality rigid polyvinyl chloride as the Lunkenheimer LUNCOR Valve.

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LUNKENHEIMER®

THE ONE *Great* NAME IN VALVES

L-255-16

IN A FREE ECONOMY

You Can Lead a Horse to Water But . . . . . .

WHEN the United States Supreme Court throttled the gas producer with price fixing, several interstate pipeline projects were postponed. The builders still want to construct them but they no longer have assurance of an adequate gas supply. Rather than sell under prices fixed by the Federal Power Commission, many producers declined to make contracts.

In other instances, some producers discontinued deliveries under existing contracts which provided for such action in case of Federal price fixing. Some who fought for the price-fixing decision promptly besought the Federal Power Commission to compel producers to continue deliveries. This seems like another issue for the courts.

The man with gas reserves not under contract cannot be compelled to enter into a contract, which means the construction of interstate transmission systems will move at a slow pace until the Natural Gas Act is clarified.

What will these gas producers do with their gas? Those who anticipate that the producer will, in time and of necessity, have to submit to price fixing should have a look around. Two Southwestern plants, one for making chemicals, the other for aluminum ore reduction, use more gas per day than all of the homes in Detroit, Milwaukee and Kansas City, combined.

Natural gas is sometimes called the "world's outstanding raw chemical." It is used in making nylon salts; can be converted into acetylene, and its hydrogen content can be combined with nitrogen (from the air) to make ammonia. As a low-cost, efficient fuel for our homes, our industries and our people, natural gas has no superior.

Rather than sell it at a government-fixed price, many producers are determined to use or sell it within the state where it is produced. The finished chemicals made from and with it can move across state lines without price control. Why not natural gas, whose benefits are anxiously sought by so many millions of Americans?

HOUSTON CONTRACTING COMPANY
General Contractors

Laurence H. Favrot • R. P. Gregory • Geo. A. Peterkin
OIL • GAS • GASOLINE • WATER PIPE LINES • 2707 FERNDALE, HOUSTON 6, TEXAS

SEVERAL THOUSAND DOLLARS SAVED ON THIS LOCATION BY USING THE–

Carter

long-stroke Hydraulic Pumping Units

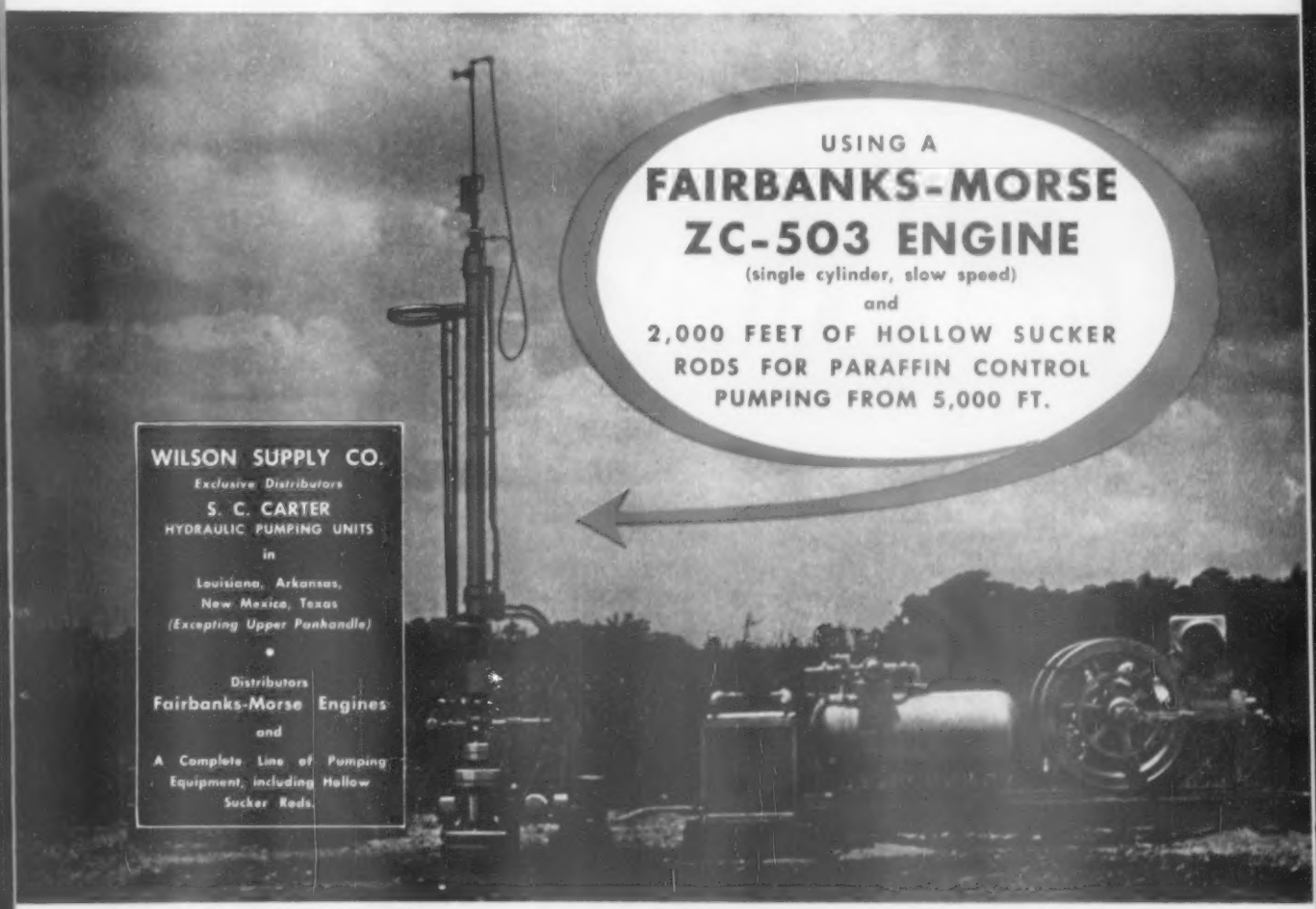
This installation of a Carter Hydraulic Pumping Unit is in the Phoenix Lake Field, Orange, Texas, on very swampy ground. A standard Pumping Unit would have required piling to be driven more than 15 feet deep and a strong foundation.

With the Carter Hydraulic Pumping Unit, only a shell base and skids were necessary—effecting a "double saving"—on the original cost of the Unit and on the installation. This saving amounted to several thousand dollars.

Nine different sizes of Carter Pumping Units are available—a size and a price to fit your specific application.

NOW AVAILABLE in 10 ft. stroke, at slight additional cost.

Contact your nearest Wilson Supply Store or write Production Division, Wilson Supply Company, Drawer 19, Houston, Texas.



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NEW ORLEANS

NOW O·C·T

a safe, strong, pra

dual completion as

FROM AN ECONOMIC STANDPOINT, dual completions provide the industry with substantial savings in any field where conditions are such that dual completions can be accomplished.

FROM AN EQUIPMENT STANDPOINT, this compact Oil Center Tool Company Christmas Tree assembly provides a safe, strong and practical means to the economic goal.

Check these Features:

In developing this dual assembly, Oil Center Tool Company presents these new features: 1. a special hanging and sealing flange on top of the tubing head; 2. steel-to-steel seals throughout the assembly through the use of Flex-Float steel rings. Standard API ring joints are also used as a seal from the atmosphere.

If you are considering dual completions, it will pay you to check these features and get the full story of this new O-C-T Dual Completion Assembly. Write for details or ask your nearest O-C-T Representative.

Dual Completion equipment was pioneered and introduced FIRST by O-C-T as early as 1941

brings You

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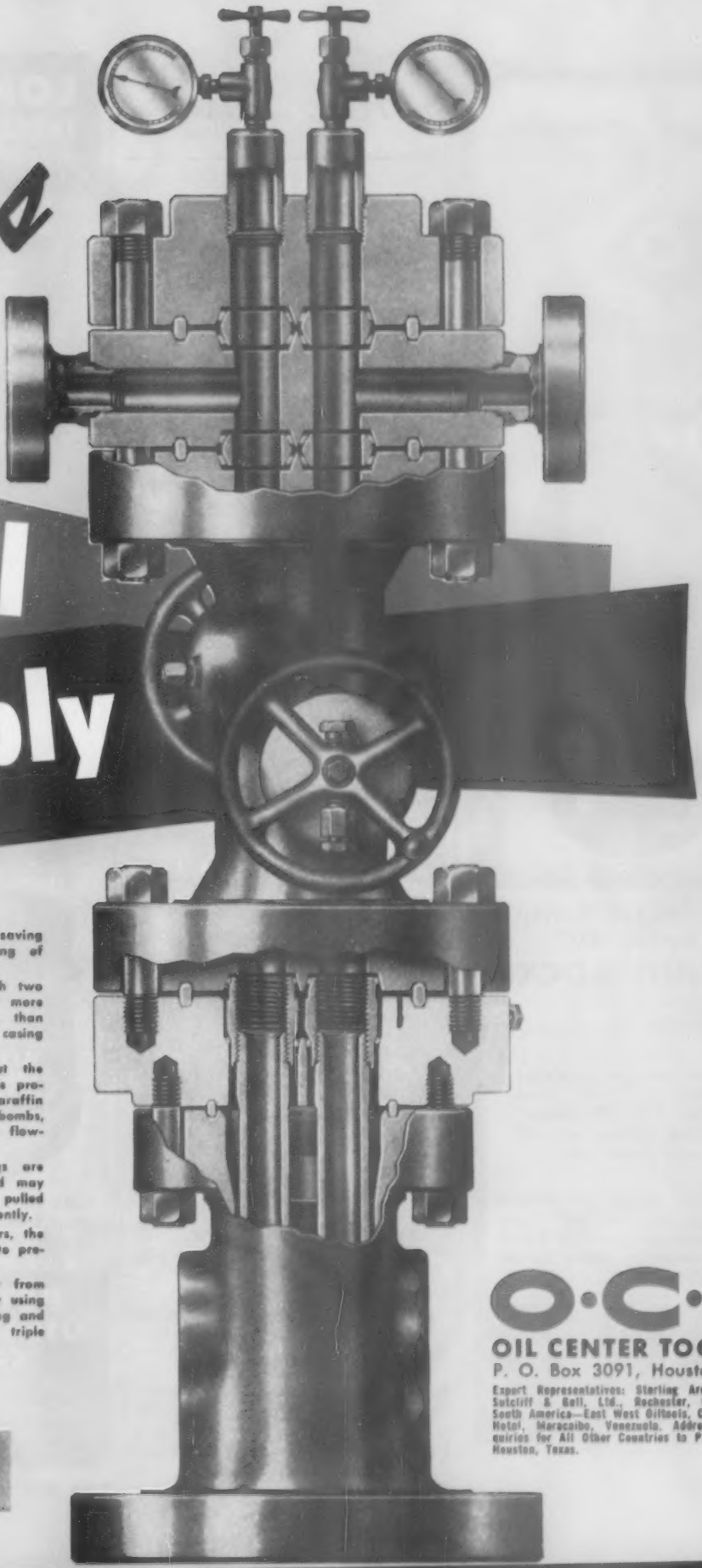


1. There is a substantial saving in cost over the drilling of twin wells.
2. When producing through two strings of tubing, it is more effective and efficient than producing through the casing annulus.
3. Full opening throughout the tree into both strings is provided for swabbing, paraffin cutting, running pressure bombs, storm chokes, pumping, flowing or for gas lifting.
4. The two tubing strings are hung independently and may be run into the well or pulled from the well independently.
5. With the use of packers, the casing may be loaded to prevent corrosion.
6. It is possible to flow from three separate zones by using the two strings of tubing and the annulus should a triple completion be indicated.

O·C·T

OIL CENTER TOOL CO.

P. O. Box 3091, Houston, Texas

Export Representatives: Sterling Areas—Le Grand, Sutcliff & Gell, Ltd., Rochester, Kent, England. South America—East West Oilfools, C. A., Del Lago Hotel, Maracaibo, Venezuela. Address Export inquiries for All Other Countries to P. O. Box 3091, Houston, Texas.

The facts are . . .

Series "80"

TUBING BLOCKS

add up to . . .

★ More weight, greater capacity—free, true falls. J-M "Klipper" Grease Seals on all Sheave bearings.

★ Larger range of sheave SIZES, 17"-20"-24". Less friction loss, roller bearing sheaves, roller thrust bearing block.

McKISSICK

McKISSICK PRODUCTS CORPORATION
Box 2496 Tulsa, Oklahoma

They Say—

Item Questioned

. . . A.A.P.G. Head "Amazed"

Dear Sir:

In your column entitled "Page 1, A Glance Ahead" of the February 7 issue I note the paragraph reading: "Gap is widening between geophysicists and geologists. Next month will see the last joint meeting of oil finders. Thereafter geophysicists will hold separate conventions, losing opportunity to exchange information with other exploration scientists."

The above paragraph is so misleading and so different from the type of reporting we have come to expect from The Oil and Gas Journal that I was amazed to read it. It is true that definite plans have not been made for additional joint meetings of A.A.P.G. and S.E.G. but it is not true that there is a wide gap between us . . . Our relations with the officers and members of S.E.G. during this year have been most friendly and cooperative. Many individual members of S.E.G. have told me personally that they hope the holding of joint meetings of the two exploration societies can be resumed in the near future.

The fact of the matter is that A.A.P.G. and S.E.G. have grown so large that it is very difficult to house the members of both societies in the hotels in any but the largest cities . . .

I trust that you will find it convenient somewhere in the coverage of the New York meeting to clarify the situation and correct the erroneous impression given in your February 7th issue.

Edward A. Koester
President
American Association of Petroleum Geologists
Wichita, Kans.

. . . S.E.G. Back Geologists

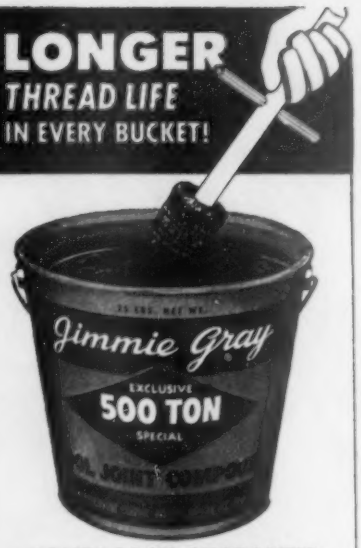
Dear Sir:

I have noted your column, "Page 1," of the February 7 issue . . .

It is indeed unfortunate that such a connotation has been placed on the separation, which occurred because of the tremendous growth of the A.A.P.G. and S.E.G. . . .

Actually, relations have never been more cordial between the two societies. S.E.G. owes a great debt to the A.A.P.G., which sponsored and helped S.E.G. in every way until it has grown

LONGER THREAD LIFE IN EVERY BUCKET!



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Use JIMMIE GRAY Dope Brushes

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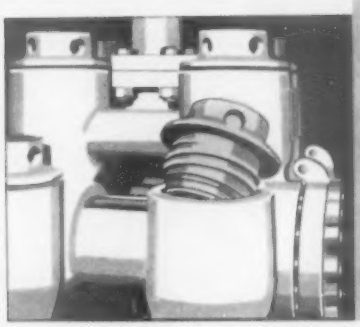
Quality Oil Field Lubricants Available in LA. - MISS. - TEX. - N.M. - N.D. - WYO.

NEW EMSCO D-700

packs extra power for jet drilling needs



Screw Type Valve-pot Covers. Distinctive one-piece threaded valve-pot covers provide quick and easy access to valves . . . reduce bulk and weight.

The new and powerful Emsco D-700 Power Slush Pump delivers the high pressures and volumes necessary for jet bit, big hole and deep drilling.

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HEAVY-DUTY TUFF-TEMPER Pump

into a mature and separate organization. . . .

Your implication is that a gap exists which does not exist. Actually, the two societies will meet together, as in the past, in regional meetings, and every possible method of exchanging information is being utilized. . . .

I trust that the Journal, in the interests of fair reporting, will rectify the wrong impression created.

Paul L. Lyons
President
Society of Exploration Geophysicists
Tulsa, Okla.

. . . Geophysicist Has His Say

Dear Sir:

An item on "Page 1" of your February 7 issue has struck a particular sore spot of mine. The item is your supposition that the gap is widening between geophysicists and geologists because their societies will have separate meetings after March. The sore spot is the tendency of the oil industry to consider geologists and geophysicists as separate and distinct.

To your supposition, I answer: "Not necessarily. It might have the opposite effect." The joint session has gotten so big that a degree of separation has existed for some time. . . .

If we can get geologists to our geophysical conventions, and vice versa, I believe we can both devote more thought to the problems of the other. If we can, the gap will narrow, not widen. . . .

A widening gap between geophysical geologists and general geologists would indeed be a tragedy. And I believe the burden of preventing it lies with us in the geophysical branch, in better selling of our own contributions.

Pierson M. Ralph
Supervisor
Geophysical Service, Inc.
Casper, Wyo.

. . . Claims Injustice Done

EDITOR

YOUR EDITORIAL COMMENTS ON PAGE ONE FEBRUARY 7 OIL AND GAS JOURNAL ABOUT GAP WIDENING BETWEEN GEOLOGISTS AND GEOPHYSICISTS AS EVIDENCED BY SEPARATE FUTURE ANNUAL MEETINGS AFTER ONE NEXT MONTH IN NEW YORK CITY IS ANYTHING BUT CORRECT. APPARENTLY, YOU DO NOT RECOGNIZE THE TREMENDOUS GROWTH IN A.A.P.G. AND S.E.G. AND THE FACT THAT

THESE SOCIETIES ARE ON THE FRIENDLIEST TERMS. SUCH EDITORIAL COMMENTS CAN ONLY CAUSE SUSPICIONS AND CREATE ILL WILL WHERE NONE EXIST. AN INJUSTICE HAS BEEN DONE BY YOUR GREAT MAGAZINE WHICH SHOULD BE CORRECTED.

ROY L. LAY
THE TEXAS CO.
NEW YORK, N. Y.

Editor's Note: The implication in the item carried in the Journal's February 7 issue is not that there is a fight or disagreement between the A.A.P.G. and S.E.G. It refers to a less tangible—but nevertheless real—gap that has been openly discussed by many geologists. The gap also has been the subject of some items published by the associations. The Journal is interested in strengthening the bonds between the A.A.P.G. and S.E.G. But this does not prevent the gap from existing. It is there. The Journal also thinks it is unfortunate that the joint national meetings must go. We hope the future regional meetings will include both geophysicists and geologists—and that the two will be brought closer together by them.

CALENDAR

MARCH

1-2 American Gas Association committee on natural gas reserves, Baker Hotel, Dallas.

1-2 Fourth Symposium on Subsurface Geology, University of Oklahoma School of Geology and Oklahoma Geological Survey, Oklahoma Memorial Union Building, Norman, Okla.

4 Southern Gas Association, transmission management conference, Shamrock Hotel, Houston.

7-11 National Association of Corrosion Engineers, Palmer House, Chicago.

9-11 American Petroleum Institute, Division of Production, Southwestern spring meeting, Jung Hotel, New Orleans.

17-18 Southern Gas Association, Distribution Management Conference, Jung Hotel, New Orleans.

20-23 American Institute of Chemical Engineers, Kentucky Hotel, Louisville.

23-24 Pacific Coast Gas Association, accident prevention conference, Santa Barbara, Calif.

23-25 American Petroleum Institute, Division of Production, Mid-Continent District, Herring Hotel, Amarillo, Tex.

26 North Texas Oil and Gas Association twenty-fifth annual meeting, Wichita Falls, Tex.

27-29 Texas Independent Producers and Royalty Owners Association, ninth annual meeting, Hotel Texas, Fort Worth.

28-30 Western Petroleum Refiners Association, 43rd annual meeting, Plaza Hotel, San Antonio.

28-31 American Association of Petroleum Geologists, Society of Exploration Geophysicists, and Society of Exploration Paleontologists and Mineralogists, annual meeting, Hotel Statler, New York.

28-April 1 American Society for Metals, 9th western exposition and congress, Pan American Auditorium, Los Angeles.

30-April 1 17th annual American Power Conference, sponsored by Illinois Institute of Technology, Sherman Hotel, Chicago.

APRIL

4-5 Wilcox Trend Symposium, Eighth Oil Recovery Conference, Texas Petroleum Research Committee, Texas A. & M. College, College Station, Tex.

5-7 Corrosion control short course, sponsored by University of Oklahoma and Central Oklahoma Section of National Association of Corrosion Engineers, University of Oklahoma Extension Study Center, Norman, Okla.

13-15 Rocky Mountain District, American Petroleum Institute, Division of Production, Gladstone Hotel, Casper, Wyo.

13-15 Natural Gasoline Association of America, annual convention, Baker and Adolphus hotels, Dallas.

13-15 American Society of Lubrication Engineers, tenth annual meeting, Hotel Sherman, Chicago.

13-15 National Petroleum Association, 52nd semiannual meeting, Cleveland Hotel, Cleveland.

18-20 American Society of Mechanical Engineers, spring meeting, Lord Baltimore Hotel, Baltimore.

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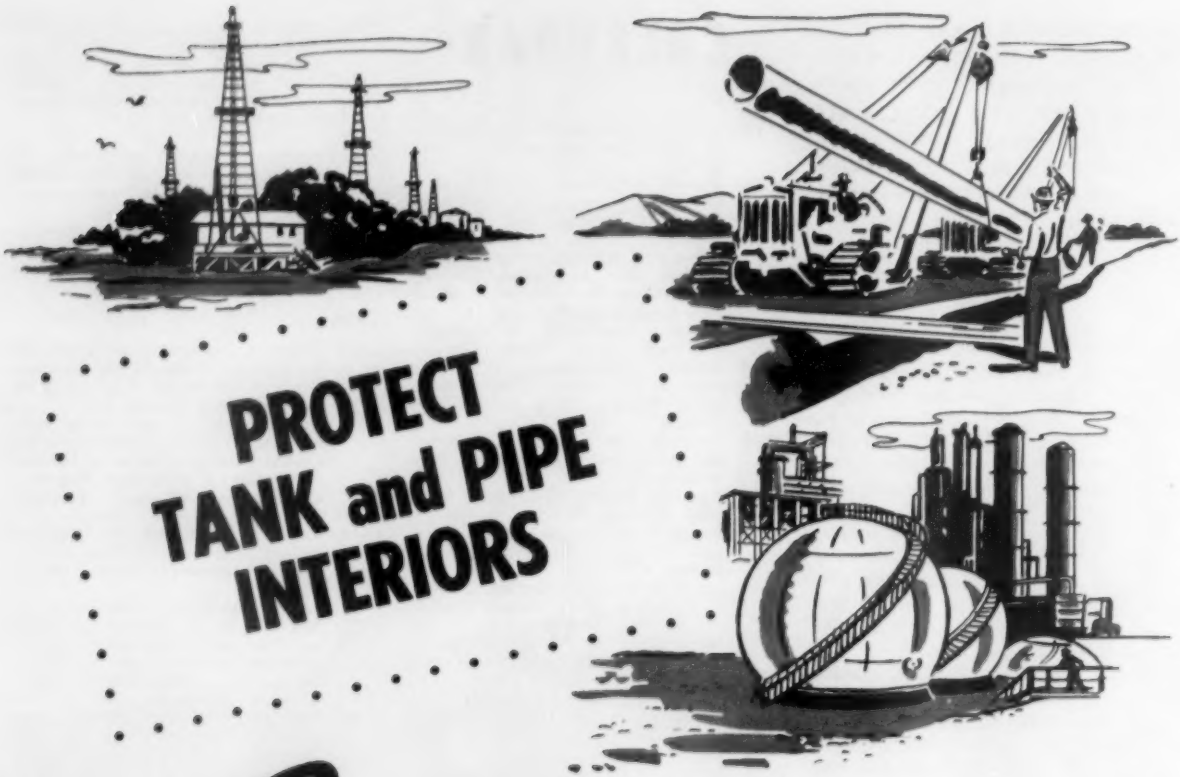

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19-20 Pacific Coast Gas Association, distribution conference, Phoenix.

19-21 Southwestern Gas Measurement Short Course, North Campus, University of Oklahoma, Norman, Okla.

20 American Society for Testing Materials —DCC, Kansas regional group meeting, Broadview Hotel, Wichita, Kans.

20-22 Petroleum Industry Electrical Association, annual conference, Shamrock Hotel, Houston.

24-27 American Society of Mechanical Engineers, Region VIII engineering conference, Rice Hotel, Houston.

25-26 Independent Petroleum Association of America, midyear meeting, San Antonio.

28-29 American Petroleum Institute, Division of Production, spring meeting of Pacific Coast district, Statler Hotel, Los Angeles.

29-30 American Association of Petroleum Landmen convention, Hilton Hotel, Fort Worth.

MAY

1-4 Liquefied Petroleum Gas Association, annual convention, Conrad Hilton Hotel, Chicago.

1-4 American Institute of Chemical Engineers, Shamrock Hotel, Houston.

9-10 American Gas Association, Gas Supply, Transmission and Storage Conference, Hotel William Penn, Pittsburgh.

9-12 American Petroleum Institute, Division of Refining, midyear meeting, Jefferson Hotel, St. Louis.

11-12 Pacific Coast Gas Association, gas supply and transmission and conference of technical session, Palm Springs, Calif.

11-13 American Petroleum Institute, Division of Production, Eastern District spring meeting, William Penn Hotel, Pittsburgh.

12-13 Sixth Symposium, "Automation—Engineering for Tomorrow," School of Engineering, Michigan State College, East Lansing, Mich.

12-19 Sixth Latin American Congress of Chemistry, Caracas, Venezuela.

14-22 World Wide Chemical Plant and Equipment Exposition and Congress, Frankfurt, Germany.

16-18 American Petroleum Institute, Division of Transportation, products pipeline confrence, Edgewater Beach Hotel, Chicago.

16-18 Southern Gas Association, New Orleans.

20-22 Appalachian Geological Society, Virginia Geological Survey, and West Virginia Geological Survey, spring field conference, Kavannaugh Hotel, Harrisonburg, Va.

23-25 American Petroleum Institute, Division of Marketing, midyear meeting, Chase and Park Plaza hotels, St. Louis.

26-27 Western Petroleum Refiners Association, technical-industrial relations meeting, Settles Hotel, Big Spring, Tex.

26-27 Kentucky Oil and Gas Association, annual meeting, Lafayette Hotel, Lexington.

30-June 1 Chemical Institute of Canada, thirty-eighth annual conference and exhibition, Quebec City, Que.

JUNE

1-3 Tenth annual Short Course on Gas Technology, Texas College of Arts and Industries, Kingsville, Tex.

5-9 Canadian Gas Association, annual meeting, Sheraton-Broeck Hotel, Niagara Falls, Ont.

6-9 Oil and Gas Power Division, American Society of Mechanical Engineers, 27th annual conference and engineering exhibit, Hotel Statler, Washington, D. C.

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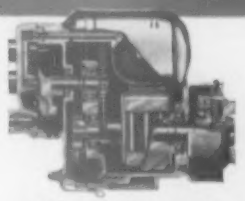

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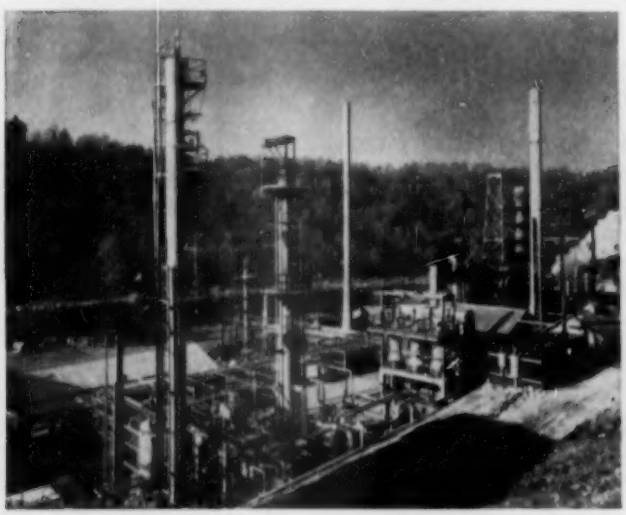
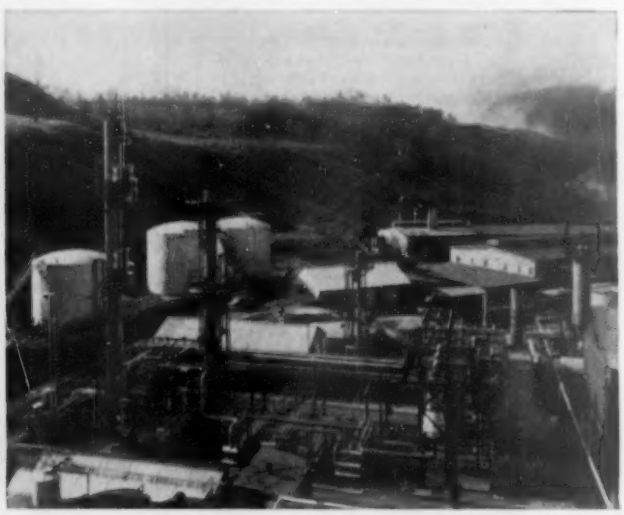
Standing out in bold relief are the reactor-heater section (left) and compressor house of the 1,500 barrel per day UOP Platforming unit — the largest of three built for Quaker State Oil Refining Corporation — at the company's Farmer's Valley, Pa., refinery.



The Allegheny River is only a stone's throw from the Platforming unit at Quaker State's refinery at Emlenton, Pa. The unit has a daily capacity of 1,000 B/SD.



Rolling hills loom behind the 1,000 barrel per day Platformer at the St. Marys (W. Va.) refinery of Quaker State. The unit is a duplicate of the one at Emlenton.

Three UOP Platforming Units Solve Pressing Octane Problem For Quaker State Oil Refining Corp.

By Guy B. Hunter
Executive Vice President
Quaker State Oil Refining Corporation
Oil City, Pennsylvania

OUR company recently concluded a three-way program of product improvement which was highlighted by the installation of three UOP Platforming units, thus giving Quaker State Oil Refining Corporation the distinction of being the first independent refiner to build three of these units at one time.

Guy B. Hunter

Quaker State for more than half a century has been world renowned for its lubricating oils. Its gasolines, distributed under the brand name of "Sterling," have enjoyed an equally high reputation in the marketing areas of our three refineries at Farmer's Valley and Emlenton, Pa., and St. Marys, W. Va. The English pound sterling sign, symbol of our gasolines, always has been the motorist's assurance that he was purchasing the highest quality motor fuels that the petroleum refining industry was able to produce.

We experienced little or no difficulty in meeting octane requirements as the trend moved upward toward more powerful gasolines, but as the level approached 93 we were confronted with a serious problem because our thermal cracking equipment could not be operated economically above that figure. It was therefore apparent that if "Sterling" gasolines were to continue their leading position, another way must be found to increase our octanes.

Planned for the Future

We not only had the immediate problem of producing a higher quality motor fuel but we, like so many other independent refiners, also had to "take out insurance" against the day when octane levels would be still higher. A thorough study of the catalytic reforming field convinced us that the UOP Platforming process was indeed the answer to the situation and would give us an ample octane potential cushion for the future.

We based our decision to install Platforming at all of our refineries on four major factors which were, briefly, the commercially proved experience of Platforming; the proved reliability and the many years of satisfactory service we received from Universal Oil Products Company; the high degree of market flexibility which the process would give to our operations, and the conviction that we would be equipped to meet all anticipated octane increases in the foreseeable future.

Operation of the three Platformers has convinced us that our selection was a wise one. "Sterling" gasolines now are among the highest octane motor fuels available in our marketing areas, which are concentrated through the heart of the Allegheny Mountains in Western Pennsylvania and along the upper reaches of the Ohio River in West Virginia. Additionally, through Platforming, we have been able to increase substantially our overall cracking capacity by utilizing existing thermal reforming equipment for more extensive cracking service.

Full Boiling Range Gasoline

Quaker State is among the first to produce a 98 leaded octane Platformate. Furthermore, when the unit at Farmer's Valley went on stream, it marked the first time that a Platformer in the Eastern part of the United States was operating on full boiling range gasoline.

The same type of charge stock is fed to the Platforming units at Emlenton and at St. Marys. It boils in the range of 80° F. to 400° F., and it is low in naphthene content. Despite the fact that the feed stock contains an unusually high contaminant concentration, special provisions in the design of the units have enabled us to maintain satisfactory operations at the desired octane number.

We are more than satisfied with the operation of our three Platforming units, which give us a daily capacity of high quality gasoline as follows: 1,500 B/SD at Farmer's Valley and 1,000 B/SD each at Emlenton and St. Marys. From the standpoint of economics, we are pleased to report that Platforming has made it possible for Quaker State to produce 98 leaded octane gasoline at a yield of 81.8 per cent as against our previous operations by which we produced a 93 leaded octane product at 72 per cent yield.

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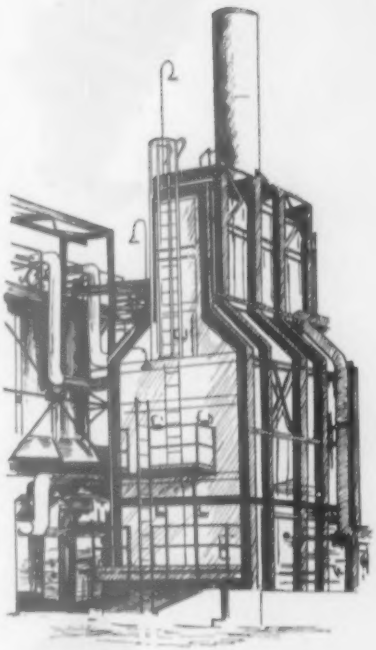

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The OIL AND GAS JOURNAL

TULSA, OKLAHOMA

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JOURNALLY SPEAKING . . .

Reader vs. Writer

COMES now for hearing and trial the case of Meticulous Reader versus Careless Writer.

Complaint—Plaintiff, a San Francisco subscriber to The Oil and Gas Journal, alleges: "Kicking phrases around is quite as dangerous for you as for F.D.R., Jr. It's 'glisters.' Glass houses? Be very careful also of the lily; it's 'paint,' not 'gild.'"

Findings of fact: The Journally Speaking column of February 7 chided Franklin D. Roosevelt, Jr., for saying that Dad Joiner discovered Spindletop and forthwith proclaimed "Oil is where you find it." In so doing, Careless Writer used the phrase "All that glitters is not gold." No mention was made of the lily. Therefore Count II of complaint is dismissed as irrelevant, incompetent, and immaterial.

One William Shakespeare, identified as a sometime writer of certain plays, is generally credited (although with no proof established) as having originated the following phrases: "All that glisters is not gold," and "To gild refined gold, to paint the lily."

Defense—Defendant, being sworn, testified as follows: That plaintiff has not established fraud because defendant did not represent himself as quoting Shakespeare, correctly or otherwise, and, for all the record shows, might have coined the phrase himself. That said column was not written for Shakespearean scholars but for operating oil men who may have been guilty of misquoting Shakespeare themselves at times. That Webster's Unabridged Dictionary states that "glitter" and "glister" are synonymous, and that therefore the essential meaning was unaltered by the substitution. That it is common practice among Twentieth Century Americans to modernize, condense, and paraphrase classical quotations, such as "Gild the lily."

Defendant admitted that he, like all who speak or write for publication, lives in a glass house and must be prepared to dodge stones, but in rebuttal submitted he is too darn *(sic)* busy to look up the origins of all phrases used and is satisfied if a reasonable percentage of his readers get the drift of what he is trying to say. Defense rested.

Disposition—The case will go to the jury.

Two-Master

WITH mixed emotions of civic pride and professional humility we note that in Venezuela apparently our home town is better known than our favorite oil publication.

A letter from that country recently arrived addressed simply to The Oil & Gas Journal, Tulsa, and up in the corner was neatly typed: "Postmaster: I am sorry, but the street name and number is unknown. The mentioned magazine is published for oil men." The letter reached us promptly due to this identifying memo, our location next door to the post office, and the fact that we do receive quite a bit of mail.

We like to think that Tulsa is a pretty fair-sized village, but it's not so large that the Big Yellow Book is completely unknown. As a matter of fact, we get bushels of mail (telegrams, too) without any street address, and the post office has never complained that it had any trouble locating us.

But for those who do want to know our street address, it's printed at the top of both our mastheads. A masthead, we might explain, is a nautical term meaning the top part of a ship's mast, but the journalistic profession uses it (with Webster's sanction) to mean a column of type carrying a publication's name and address and other information about it.

We're so big we have to have two mastheads. One, the business masthead, is on the left-hand column of this page. The other, the editorial masthead, is on our double-truck Table of Contents, pages 2 and 3.

Yup, we're a two-masted vessel, which is one reason why our anchorage can be spotted on the Tulsa skyline.

—*Henry D Ralph.*

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FOR HELPFUL SUGGESTIONS as to how Baker Retainer Production Packers, Baker Wire Line Bridge Plugs and Baker Cement Retainers can make *your* operations more profitable, contact the Baker representative in your area. His knowledge is based upon applications in nearby wells, and he can give you *specific recommendations* to help solve *your* problems.

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2. BAKER WIRE LINE BRIDGE PLUGS *set positively, hold against any pressure safe for the casing,* (from above or below) *and are easily and quickly drilled up.* Made of Cast Iron or of Magnesium to meet varying conditions imposed by well fluids or length of installation time.

3. BAKER CEMENT RETAINERS are constantly being improved and are always reliable for all types of squeeze or remedial cementing, testing, plugging-off, and similar applications. They are easy to run—pack off positively—hold any pressure safe for the casing. Readily used as casing bridge plugs.

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HOUSTON · LOS ANGELES · NEW YORK

Sunset Limited hits the switch

WHEN a railroad builds a pipeline, it's man-bites-dog type of news. Southern Pacific Railroad made such news last week with its announcement that it will build a products line from Los Angeles to El Paso, to serve points in between.

Here's one railroad that apparently thinks the oil industry is here to stay. Railroads have been fighting pipelines unsuccessfully for some 30 years and now one of them accepts the practical maxim "If you can't lick 'em, jine 'em."

This action is a good example of the futility of trying to hold back technological progress, and of the value of competitive initiative. If the railroads had had their way, and if the oil industry hadn't fought them tooth and nail and hadn't gone out on its own and established competing transportation arteries, there wouldn't be any pipelines today.

THERE ARE OTHER INTERESTING ASPECTS to this announcement. If this pipeline is built and operates successfully, it will be the first time that such a project has been put over by anyone completely outside the oil industry—the first real, 100 per cent common-carrier products line, with no shipper-owner tie-ups.

Many independent promoters have tried and failed for lack of financing and lack of firm commitments to use the line. Every oil pipeline built to date has been backed by people who had oil to sell, refineries to feed, or market outlets to serve.

The S.P. is in a unique position to succeed where others have failed. It already has a right-of-way. It can surrender a fair volume of tank-car traffic to its own line. And it has been dealing with refiners and marketers who can use the line, and presumably has tested their readiness to do so.

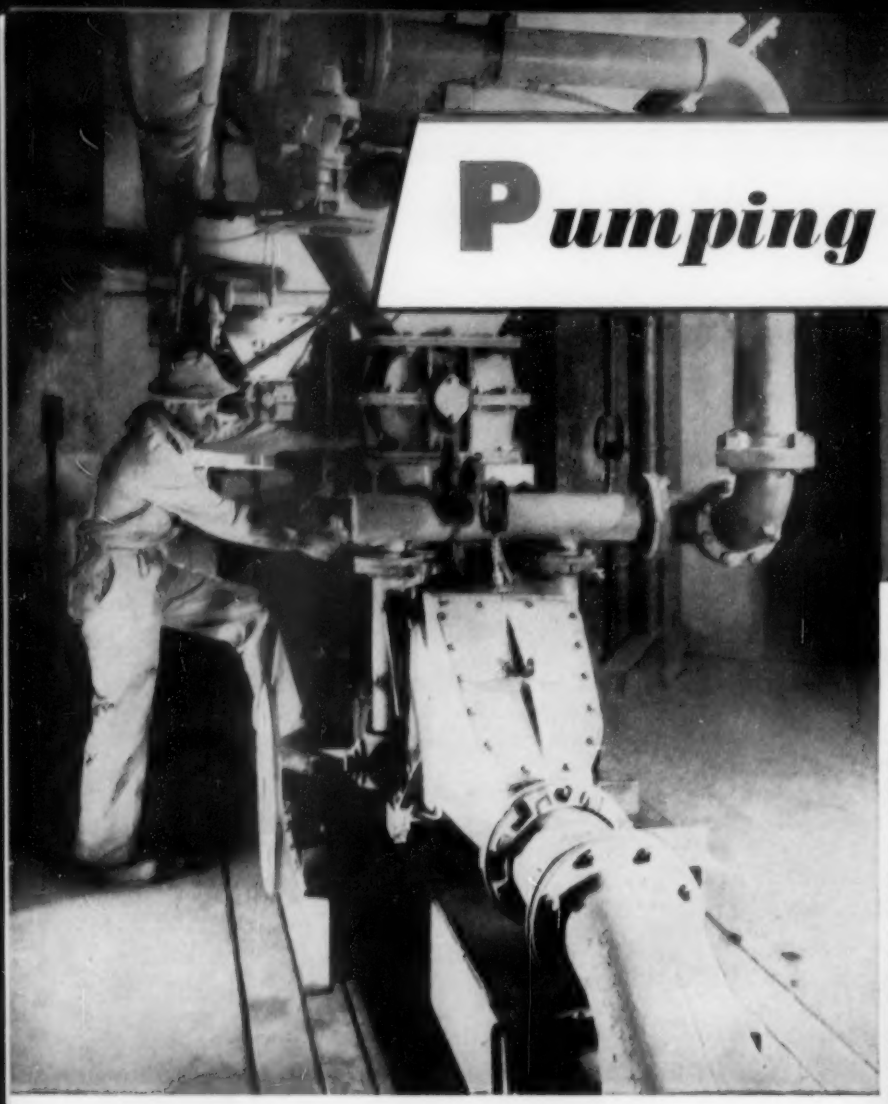
BUT THE MOST SIGNIFICANT ASPECT is the concept of linking Texas and California with a products line fed mainly from the west.

For years there has been agitation for a crude line to feed Texas crude to Los Angeles refineries, on the theory that California faced a chronic shortage of crude. Other proposals were for refineries in Arizona, using crude from east of the Rockies. But the Sunset State won't admit that its sphere is limited. Instead, it is out to fight for the intermountain market.

So now we will have interregional competition in the Southwest, similar to that recently launched in the Northwest. National defense will benefit from such a transcontinental link. So will the shippers who use the line, and the consumers along the route.

That's the way competition works in this industry. It's gratifying to see a railroad get into the act, finally.

Pumping Cement



● At the plant, Lone Star Cements are pumped to packing machines or bulk-cement cars direct from huge storage silos—separate silos being used for each cement. So, when you pump cement at the well—whether the hole is deep or shallow, whether there's a sulphate-water condition, and whether it is securing a casing, a squeeze job, plug back, restoring lost circulation or any other purpose—the Oil Man can be *sure* he is getting the cement he needs for the particular job.

For the right cement in the right place at the right time, just select the Lone Star Cement that's specially designed to fit the job.

LONE STAR CEMENT CORPORATION

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Select Cement to Fit the Job!

THIS WEEK . . . . . IN THE NEWS

Production . . .

• No letup is seen in the current high rate of oil production. The Texas allowable for March will be the second highest in history and about 50,000 bbl. per day above the February quota. Only slight changes are expected in Louisiana and Oklahoma where basic allowables are unchanged.

• New listening device soon will be made available to help spot down-hole leaks in tubing and casing. Gadget was developed by Atlantic Refining Co. and has proved highly accurate in first field tests.

• Operators in La Gloria field, Texas, plan unitization and pressure-maintenance program. An estimated 5,000,000 bbl. of additional oil would be recovered.

Refining . . .

• New trend in automobile design means refiners must increase production of high-octane fuel for years to come. Ford official foresees compression ratios up to 10 or 12 to 1. Such engines would require gasoline of more than 100 octane.

• Octane race is making it increasingly difficult to operate small inland refineries at a profit. Latest such plant to be doomed is Magnolia's 13,320-bbl. refinery at Fort Worth. It will close May 1.

Pipelines . . .

• A traditional rival has joined the pipeliners. Southern Pacific Co., major U. S. railroad firm, will build 800 miles of product pipelines along its right-of-way between Los Angeles and El Paso. The lines will serve the rapidly expanding Arizona products market.

• A new grade of line pipe, twice as strong as any now in use and more than twice as costly, is on the market. National Tube Division of U. S. Steel says the pipe comes in two strengths. One has an ultimate strength of 105,000 psi. and a yield of 90,000 psi. The other boasts an ultimate of 120,000 psi and a yield of 105,000 psi.

• Tennessee Gas Transmission will enter the New York metropolitan market next winter. T.G.T. will complete a 1,000-mile loop in its system with a link connecting Hebron, Pa., and Greenwich, Conn. Construction starts May 1.

International . . .

• A new way to get into the tanker business is being explored by Saudi Arabia. World opinion was critical of the deal to give Onassis preference in lifting crude, so the country now proposes to buy Onassis' tankers and give control back to the Greek shipowner.

• Formosa is getting under way on an oil-exploration program. Plans include drilling of a wildcat near Taipeh and the island's first seismic project, already started on the southwestern coastal plain.

Regulation . . .

• The FPC will probably reveal its basic rules for setting natural-gas prices before the end of March. It may go no further than listing the factors it will consider in passing on requests for price changes.

• The FPC has run into strong criticism because of the changes in the Natural Gas Act it would like to see made. None of them are new and critics say all the changes strengthen the power of the agency instead of improving its service.

• The House interstate commerce committee is asking federal agencies for comment on exempting gas producers from FPC control. The committee is laying groundwork for hearings on several bills already in the legislative hopper.

Imports . . .

• Imports of crude and products have reached an all-time high, and the trend is upward. Total imports in December averaged more than 1,325,000 bbl. daily, breaking the previous record set in December 1952.

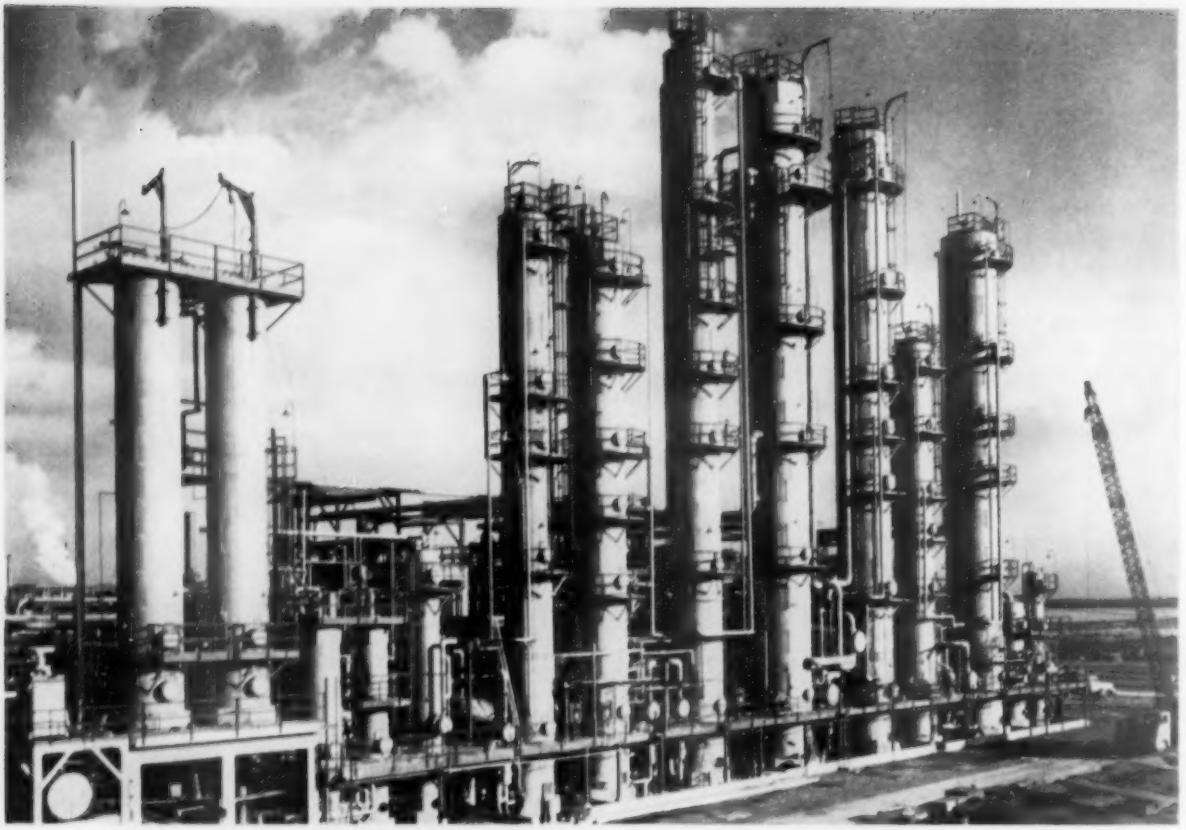
• Companies reporting their imports to the Texas Railroad Commission have again boosted estimates for the first quarter. Latest forecast indicates total imports may climb to 1,360,000 bbl. daily this quarter.

Offshore . . .

• Cost of drilling in tidelands could be reduced sharply if some of the problems now confronting offshore operators are solved. There's plenty of room for cost trimming, says official of Humble Oil & Refining Co.

• A record bid of $6,572,000 was submitted by The California Co. for 4,687-acre lease at the mouth of the Mississippi.

• Geophysical work off the coast of Louisiana will continue at fast pace. The state issued 15 geophysical permits in January covering many areas offshore. In January, 44 rigs were operating in Louisiana waters, almost twice as many as a year earlier.



SUN OIL'S MARCUS HOOK petrochemical plant produces 55 million gallons of aromatics a year.

Aromatic Chemicals: A Boom Ahead?

- **Oil industry is supplying more and more of the total volume, and the outlook is for an even greater oil share**

- **Most interesting to watch will be p-xylene; demand for this product could soar if Dacron use is increased**

TULSA. — Aromatic chemicals, once produced almost entirely as byproducts of the coke oven, are coming more and more from oil.

Refiners are producing these highly active ring compounds by catalytic reforming. If the demand keeps growing, more of them will get into the act.

These chemicals and their principal uses are:

. . . **Benzene**—a key material for synthetic rubber and plastics.

. . . **Toluene** — used for explosives, aviation gasoline, and solvents.

. . . **Xylenes**—now cutting into toluene solvent uses and coming up fast as an important raw material in making other chemical products.

The ones to watch are the xylenes.

The most spectacular of this group is p-xylene, starting point for the new synthetic fiber Dacron. More widespread use of this fiber—with a cheaper price tag — could begin a regular p-xylene boom.

How it all started . . . Before World War II aromatics were largely supplied as byproducts in the coking of coal. During the war, the oil industry got into aromatics with both feet to meet the great military demand for toluene for explosives. Production increased nearly seven-fold between 1940 and 1945. The oil industry completed 15 toluene plants in this period. Making benzene and the xylenes followed naturally.

Today petroleum refiners share heavily in the aromatics market. Here's just how much:

. . . **In 1953** some 23 per cent of total U.S. benzene, nearly 75 per cent of the toluene, and more than 90 per cent of the xylenes came from oil.

. . . **In 1954** petroleum's estimated share of total benzene is 35 per cent. Total toluene is down, but oil accounted for about 75 per cent. Xylenes from oil still account for better than 90 per cent of the total xylene production.

P-xylene is today's glamor girl among the aromatics. If demand increases even more there could be some interesting repercussions.

Some think if p-xylene demand goes up and more p-xylene is produced, the other xylenes produced at the same time will give toluene stiff competition for the solvent market. Actually, this is not quite true. The p-xylene has not been removed from much of the solvent xylene now sold. And p-xylene plants are operating at below capacity.

P-xylene is extracted from mixed xylenes by the "ice cream freezer technique"—fractional crystallization at low temperatures.

It consists of two-stage process in which the crystals are separated by a centrifuge. In the first stage, the xylene feed is cooled to —95° F. by ethylene

refrigeration. In the second stage, propane refrigeration does the chilling.

Even if all the plants were operating at capacity, they would recover only 25 per cent of the p-xylene in a typical commercial xylene mixture. If it becomes necessary, other methods can be used to boost the recovery.

Perhaps the most promising of these was developed by California Research Corp. It uses carbon tetrachloride to increase the yield of p-xylene during the low-temperature crystallization. The carbon tetrachloride and p-xylene form a solid addition compound which can be separated from the other two xylenes.

This process calls for more equipment and higher investment cost. But if p-xylene demand becomes critical it might be used commercially. The output of p-xylene may also be increased by an economical process to make p-xylene from some of the m-xylene and o-xylene.

Who's in it . . . Standard Oil Co. of California was the first to make pure p-xylene. In a short time Humble Oil & Refining Co. and Phillips Petroleum Co., in cooperation with Cosden Petroleum Corp. followed suit. Sinclair Oil Co. is now coming up. Standard Oil Co. (Ind.) considered an installation and later backed out, at least for the time being.

With Sinclair included, there will be a total p-xylene capacity of some 72 million pounds a year. This could be a lot of p-xylene, or it could be little. It all depends on which way Dacron production goes and what new uses are found for the chemical.

More p-xylene can be produced than is needed for Dacron until 1960 unless the growth of Dacron increases markedly. A better textile market and more use of p-xylene for Mylar film will probably increase demand in 1955. Hercules Powder Co. is expanding production of chemicals from p-xylene.

Since 1945, California Standard has used o-xylene to make phthalic anhydride, a drying agent for varnishes and resins. This is in direct competition with coal-tar naphthalene. The company now plans to build a large (50 million pounds a year) isophthalic acid plant with m-xylene as the raw material. Construction is now under way. The isophthalic could be competitive with phthalic anhydride and maleic anhydride but it could carve out some new markets of its own, a not uncommon thing in the chemical field.

Where does refiner stand? . . . The average refiner can break into this petro-aromatics field. The basic equipment is a catalytic reformer. The additional investment needed is comparatively small.

Aromatics . . . their uses

BENZENE — Over one-half goes to styrene for synthetic rubber, plastics, paints, and to phenol; also for synthetic detergents, aniline, nylon, and chemicals such as maleic anhydride, mono and dichlorobenzenes, nitrobenzene, benzene hexachloride and DDT.

TOLUENE — Mostly for TNT and aviation gasoline blend; also solvents, protective coatings, and chemical synthesis.

XYLENES — Largely to solvents and thinners; motor-fuel blend stock; p-xylene to synthetic polyester fiber (Dacron) and polyester plastic film (Mylar); O-xylene to phthalic anhydride; m-xylene to dye intermediates and isophthalic acid; ethylbenzene to styrene.

. . . And Production

	1953 production*			1954 production		
	Benzene†	Toluene‡	Xylenes‡	Benzene	Toluene	Xylenes
Petroleum	63,043	115,535	102,886	82,000	106,000	111,000
Coke oven and other	209,701	40,713	10,588	155,000	38,000	10,000
Total	272,744	156,248	113,474	237,600	144,000	121,000
Per cent from petroleum	23.1	73.9	90.7	35	74	91

*From U. S. Tariff Commission, in thousands of gallons. †Specification and industrial grades, motor grade not included. ‡All grades.

Government says: petrochem outlook good

A slightly higher output of aromatics, nitrogen products, and synthetic rubber is the outlook for 1955.

The percentage of these chemicals produced from oil and natural gas will also increase. These two predictions are in the chemical and industry report just released by the Business and Defense Services Administration.

Benzene production will increase slightly over the estimated 1954 output of 236 million gallons. Oil will increase its share, BSDA says, from 24 to 35 per cent. Toluene may remain steady, but xylenes will continue to show gains. The government agency does not look for any rise in total output of cyclic intermediates.

Completion of new plants should bring a record output of ammonia this year. A greater percentage of this basic will be coverted to solid and liquid nitrogen compounds. Imports are expected to drop further.

The sale of government-owned synthetic rubber plants to private industry should be completed early this year, BSDA says. It predicts a 4 to 5 per cent increase in tire production with a larger gain for other rubber goods. Prices for natural rubber, and perhaps synthetic rubber, may average higher in 1955.

Potential capacity for petroleum aromatics in the United States is large. It has been estimated at more than 100 million gallons of benzene a year, based on catalytic reformate. This is about 20 per cent more than today's production.

The nation's refiners could turn out roughly 300 million gallons of toluene and mixed xylenes a year, about 1½ times present production. Other estimates of petroleum benzene capacity range up to 200 million gallons annually.

It is hard to pin down petro-aromatics capacity precisely because of the great flexibility in refinery processing. This can be of two kinds. There is the over-all refinery flexibility which permits all sorts of processing shifts to meet market changes. There is also considerable latitude in today's catalytic reforming and aromatic extraction facilities.

Most cat reformers making aromatics operate on a blocked basis, part of the time on aromatics and the rest on motor fuel production. The switch to full time motor fuel is an easy one. Throughput for motor fuel operation is about 70 per cent higher than that for aromatics. The refiner has another hedge. He can vary the relative amounts and specification for benzene, toluene, and xylenes he makes.

Today's refiner can make money producing benzene for 30 to 35 cents a gallon.

Processing . . . To get some idea of petro-aromatics processing flexibility:

Cosden Petroleum plant at Big

Spring, Tex., is an example of the small refiner in aromatics. This was the first plant to make high-purity aromatics by fractionation following the extraction step. It uses Platformer-Udex units.

Cosden splits a straightrun, desulfurized gasoline into light and heavy naphthas. The Platformer runs for about two-thirds of its operating period on the light naphtha making aromatics. The remainder of the time is used to reform the heavy naphtha into high-octane motor fuel.

Sun Oil at Marcus Hook is an example of a large refiner. Sun operates in a different manner and with perhaps even greater flexibility. Houdriformer-Udex units are operated in this blocked operation:

. . . **Benzene and toluene** are made during one part of the operating period.

. . . **Xylenes** are made separately during another part of the period.

. . . **Motor fuel** is made the rest of the time.

Other methods . . . At least four other methods are used for aromatics separation.

In Shell's extractive distillation method, prefractionation makes a concentrate. A higher-boiling material (phenol) is then added to bring about better separation in the next fractionation. Shell uses this at its Houston refinery.

Continental Oil Co. uses SO_2 extraction at its Lake Charles, La., refinery. Conoco obtains high recovery of benzene and toluene-xylene fractions from catalytic reformate.

A feed stock with lots of olefin and sulfur is processed by Roosevelt Oil & Refining Corp. at Mount Pleasant, Mich., to supplement aromatics from blocked Platformer operation. A Platreater is used to hydrogenate a fraction containing up to 40 per cent of unsaturates to give an aromatic material suitable for Udex extraction. Excess hydrogen from the Platformer is used for this purpose. Roosevelt buys these aromatic distillates, byproduct of ethylene manufacture, from chemical companies.

A feed stock with no olefins and sulfur is used by Atlas Processing Co. at Shreveport, La. Here, naturally occurring benzene is separated from a 400° F. end point naphtha by Shell extractive distillation. The naphtha comes from natural gas in the Carthage gas field.

Markets . . . The market history for aromatics can be summarized quickly:

. . . **Benzene** production went from 40 million gallons a year in 1940 to 200 million in 1950 and nearly 273 million in 1953. It was expected to remain at the 250-275 million gallon level but preliminary figures for 1954 show a production of 237 million gallons. Synthetic rubber production dropped, but this was partially offset by more use of benzene to make styrene for plastics. Benzene going to phenol increased for 1954 and there were increases for synthetic detergents, aniline and maleic anhydride.

Some benzene is made as a byproduct in producing steel. Because steel plants operated at only 65 to 75 per cent of capacity last year, petroleum benzene use increased.

. . . **Toluene's** 1940 production of more than 30 million gallons was mostly from coal tar. By 1945 production had increased to 200 million gallons, made in large part from oil. After several readjustments in the postwar period, production in 1953 was 156 million gallons. A large military demand still exists for toluene, but there is definite excess capacity.

Toluene demand was down in 1954, perhaps in part because of competition from xylenes. Preliminary figures show a small decline.

. . . **Mixed xylenes** were expected to show an increase in 1954. Preliminary figures bear this out. Yield of xylenes in coke oven operations is so low that separation is usually not economical.

Who is producing aromatics . . . and where

Company and location, date on stream—	Process	Remarks
Atlas Processing Co.:		
Shreveport, La.	Ds	Naturally occurring benzene extracted from natural gasoline and cycle product feed stocks.
Continental Oil Co.:		
Lake Charles, La.	P-So	
Ponca City, Okla.	P-Ds	(Ds shut down).
Cosden Petroleum Co.:		
Big Spring, Tex., Sept. 1952	P-U	
Eastern States Chemical Corp.:		
Houston, Tex., Feb. 1952	P-U	
Esso Standard Oil Co., (Louisiana Div.):		
Baton Rouge, La.		
Great Southern Chemical Corp.:		
Corpus Christi, Tex., Oct. 1953	P-U	
Humble Oil & Refining Co.:		
Baytown, Tex.	H-So	p-Xylene separation (1953), 25,000,000 lb. per year.
Pan American Refining Co.:		
Texas City, Tex.	H	
Petrocarbon Chemicals, Inc.:		
Irving, Tex., under construction	Ho	To process purchased naphtha stocks.
Phillips Petroleum Co. (Cosden Petroleum Corp., operator):		
Big Spring, Tex.		p-Xylene separation (1953), 5,000,000 lb. per year.
Roosevelt Oil & Refining Corp.:		
Mount Pleasant, Mich., Dec. 1952	P-PI-U	Aromatics from Platforming supplemented by hydrogenation of aromatic distillates.
Shell Oil Co.:		
Houston, Tex., Feb. 1953	P-Ds	19,000,000 gal. benzene and 33,000,000 gal. toluene per year.
Wilmington, Calif.	P-Ds	(Ds shut down).
Wood River, Ill.	Ds	
Sinclair Oil Co.:		
Marcus Hook, Pa., under construction	SB-U	Scheduled for March 1955; p-xylene separation, 10,000,000 lb. per year; total of 18,000,000 gal. per year of toluene, p-xylene and other xylenes.
Standard Oil Co. of California:		
El Segundo, Calif., Jan. 1953	P-Ds	p-Xylene separation (1953), 22,000,000 lb. per year.
Richmond, Calif.	H	p-Xylene separation, 10,000,000 lb. per year.
Standard Oil Co. (Ind.):		
Whiting, Ind.	H	Had considered 14,000,000 lb. per year p-xylene.
Sun Oil Co.:		
Marcus Hook, Pa., Nov. 1953	Ho-U	Design capacity: 19,000,000 gal. benzene, 19,000,000 gal. toluene, 15,000,000 gal. mixed xylenes.

P—Platformer, Ho—Houdriformer, SB—Sinclair-Baker Catreformer, H—Hydroformer (fixed bed), PI—Platreater, U—Udex, Ds—Shell extractive distillation, So—Liquid SO_2 extraction.

SOUTHERN PACIFIC'S pipelines will generally follow the railroad's right-of-way.

Railroad Turns to Pipelining

Southern Pacific will lay 800 miles of products lines from Los Angeles and El Paso to serve Arizona markets

SAN FRANCISCO. — Southern Pacific Co. has given pipelining a new twist with its plans to lay 800 miles of products line along the railroad's right-of-way into the growing Arizona market.

D. J. Russell, Southern Pacific president, said his railroad will take a "good look" at other areas served by Southern Pacific. More lines will be built if the "look" looks economical.

The first project planned by Southern Pacific will cost $30,000,000 and move between 10,000 and 20,000 bbl. daily of products from the Los Angeles and El Paso refining areas to Arizona. Two lines are included. They will be the first major pipelines ever built by a railroad.

One line will run from the Watson (Los Angeles) area to Phoenix and Tucson. This line also will serve the intermediate areas of Colton, Calif., the Imperial Valley, and Yuma, Ariz. The line will be 16 in. in diameter to Colton and 12 in. from Colton to Phoenix. It will generally follow the railroad's right-of-way.

The other line will run from El Paso to Tucson and Phoenix. The diameter of this line will be 8 and 10 in. The El Paso-Tucson line will follow the shortest practical route, using the right-of-way when economical.

Southern Pipe Lines, Inc., has been organized as a subsidiary of the railroad to build the line. Bechtel Corp. will assist in planning the project. The construction and engineering will be handled by Management Engineers, a Bechtel subsidiary.

Construction will start this spring, with completion scheduled by the end of the year.

Market area . . . The Arizona market has captured its share of attention in recent months from both pipelines and refiners. Russell said movement of products to Arizona has reached the point that building a products line is inevitable.

A refinery is proposed at Coolidge, Ariz., which is midway between Phoenix and Tucson, but may be doomed by the products line.

Plans for this refinery, and products lines from the refinery to Phoenix and Tucson, were announced in September by interests headed by Wiley F. Moore, one of the promoters of Oil Basin Pipeline Co., and Jack Frost, Dallas oil operator and rancher. John MacArthur, chairman of the board and president of Bankers Life & Casualty Co., Chicago, is principal financial backer of the Moore-Frost plans.

Several other projects are included in the Moore-Frost program *(The Oil and Gas Journal, September 13, 1954, page 91)*. However, the Coolidge refinery is the only project that would conflict directly with the Southern Pacific line.

Shippers . . . Russell said refiners on the West Coast and in El Paso have agreed to use the line if the rates are satisfactory. There is little chance it will go begging due to the growing demand for products in Arizona.

Arizona's population jumped from 499,261 to 749,587 between 1940 and 1950, with most of the growth centered in Phoenix and Tucson. The Phoenix population during the decade shot from 65,414 to 106,818 while Tucson grew from 36,818 to 45,454.

There are several large refiners in the Los Angeles area that might use the line. El Paso has two refineries, a 30,000-bbl. plant owned by Standard Oil Co. of Texas and a 5,500-bbl. plant owned by The Texas Co. McNutt Oil & Refining Co. has a 3,200-bbl. plant at Brickland, N. M., which is in the El Paso area.

Entering a new field is nothing new for Southern Pacific. The railroad has truck service in addition to its rail transportation. It operated steamships during World War II.

"Southern Pacific is convinced by its own studies and by a market survey made for it by Stanford Research Institute that the pipeline project is a very desirable expansion and diversification of the railroad's interests and activities," Russell said. "It will enable us to get maximum use out of our private right-of-way . . .

"By addition of pipeline facilities to our rail and truck operations, we will be able to offer the petroleum industry the service it desires in order to meet its various land-transportation requirements. This situation, we believe, will be very desirable from the oil companies' standpoint."

Atlantic's new tool is a . . .

. . . Sleuth for Down-Hole Leaks

Robert J. Enright

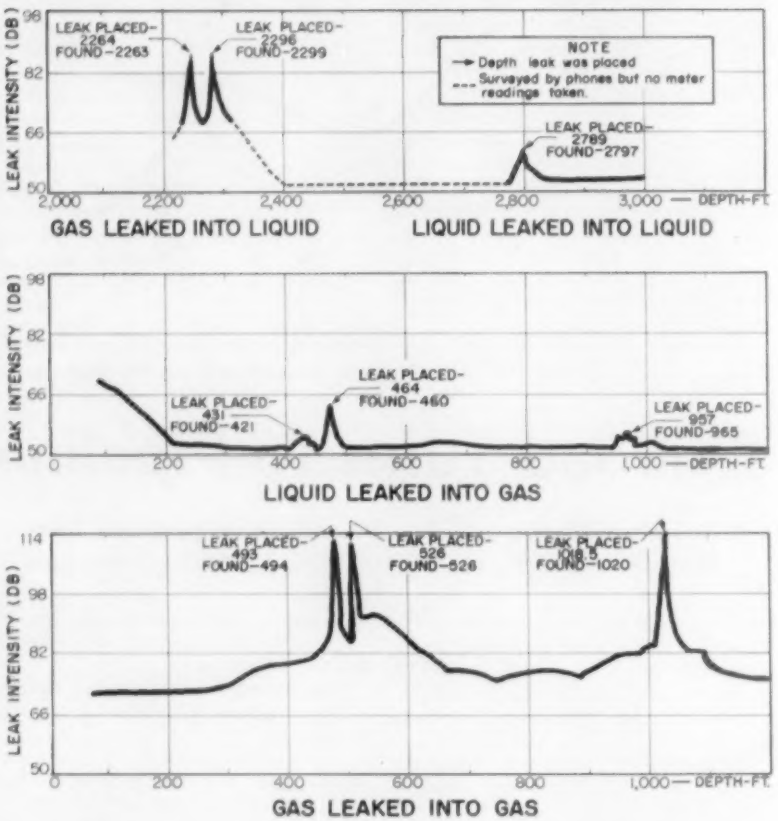
DALLAS.—A new instrument to pinpoint down-hole leaks in oil and gas wells will be offered the industry soon.

The tool takes advantage of the fact that any fluid escaping past an orifice makes noise. The leak thus tattles on itself, and the tool finds it simply by listening and spotting where the noise is the loudest.

The unit was designed and tested in the field by research personnel of Atlantic Refining Co. in Dallas. It recently was licensed to Dia-Log Co., Houston, which currently is perfecting design and carrying out further field experiments.

The listening portion of the tool is 1½ in. in diameter (designed to run through 2-in. tubing) and 30 in. long, not counting weights. It consists basically of a microphone with a ceramic pickup and a two-stage audio amplifier behind the pickup. Noise signals are transmitted from the device through an armored electric cable to a power truck at the surface. There they are recorded on a strip chart as a function of depth.

The tool can put the finger on leaks in casing, tubing, packers, or gas-lift valves. It can be used to locate liquids flowing behind the casing and even to detect points of entry of gas into high gas-oil ratio wells.



Early field tests . . . Atlantic's first controlled field tests of the device were made in East Texas field.

During these tests, the tool located within a foot or so:

. . . **Liquid to gas** leaks as small as 4 bbl. daily.

. . . **Gas to gas** leaks as small as 300 cu. ft. per hour with a pressure drop of 300 psi.

. . . **Liquid to liquid** leaks as small as 10 bbl. daily.

. . . **Gas to liquid** leaks practically down to zero flow.

Laboratory tests indicate the instrument actually can locate the point at which liquid is seeping into gas or liquid at a rate of only half a barrel a day.

How to place leak . . . In some cases it takes some maneuvering with the tool to find what's leaking.

The instrument is sufficiently sensitive to pick up a leak in the casing when run through the tubing, so some process of elimination is needed to tell which is leaking.

This can be determined by using a packer. Assuming that tubing is open ended and a packer is in the hole, pressure applied through the tubing could disclose only that the leak was at a certain depth.

If the packer is removed, the pressure is equalized between fluid in the casing and that in the tubing. A hole in the tubing then would stop leaking. If the electronic ear picks up no leak noise on a rerun, the leak is in the tubing. If it continues to record noise, the leak is in the casing.

Leaking packers and gas-lift valves usually can be spotted quickly since they are at a known depth.

Still some troubles . . . Though research work has brought the tool along as a valuable aid to oil and gas production, there are still some faults to overcome.

In the past, the device could not be run against surface pressures of more than 100 psi. This problem is about whipped. Dia-Log has perfected a new high-pressure lubricator which is now in field use. The lubricator will permit running the instrument against surface pressures of several thousand pounds per square inch.

Another problem arises when the tool is used to spot where gas is leaking into a liquid. Popping gas bubbles at the liquid level in a well make noise which may interfere with accurate location of a leak within several hundred feet of the liquid level.

A minor drawback is that the instrument cannot distinguish between a casing leak and a turbulent spot set up where fluid is channeling behind the casing.

Value proved . . . Here is one case in which the instrument proved its value.

An operator discovered that one of his producing wells in a certain field had built up 400 psi. of pressure at the surface between the surface pipe and the oil string.

The well was producing oil through the tubing from about 4,800 ft.

LEAK DETECTOR looks about like a short broom handle. The case housing listening device is only 1½ in. in diameter and about 30 in. long.

The pressure on the bradenhead would not bleed down. Possibilities of leaks in the oil string or tubing were disproved quickly. This indicated that gas from some formation down the hole was channeling to the surface behind the oil string.

The operator first pumped radioactive mud behind the casing and ran a gamma-ray instrument to follow progress of the mud down the hole. Readings on the gamma-ray instrument showed that the mud was going into a porous formation just below the surface pipe at 400 ft. The mud could not be pumped below this point.

A substantial batch of mud was pumped into this zone with no effect on surface pressure on the bradenhead.

The operator then ran the new leak locator together with a temperature survey. The locator spotted fluid disturbances at 400 to 700 ft. and several points where fluid might be coming in behind the casing, with the lowest at about 3,500 ft. The temperature survey indicated movement of fluids between 400 and 3,440 ft.

On the basis of this information, the operator perforated the oil string at 3,446-48 ft., squeezed in 425 sacks of cement, and circulated the cement to the surface. Pressure on the bradenhead dropped off immediately.

New Pipe Is Stronger

National Tube is ready to market pipe twice as strong as best in use today; cost will make its use specialized

R. G. Deering

TULSA.—A new grade of line pipe, twice as strong as the best in use today, is on the market. The price tag is right in line with its strength. It costs about 2½ times as much as the most expensive pipe now in use.

First public announcement of the new pipe was made here last week at a meeting of the Pipe Liners Club of Tulsa. A. B. Wilder, chief metallurgist of National Tube Division, United States Steel Corp., said the new pipe has been under development for several years. National Tube is now looking for customers.

Characteristics . . . The new line pipe is made from low-carbon martensite steel alloyed with several other elements. The pipe, called Type T-1 by the maker, can be made in two strengths. The first has an ultimate strength of 105,000 psi., a yield of 90,000 psi., and an elongation of 18 per cent. The second has an ultimate of 120,000 psi., a yield of 105,000 psi., and an elongation of 20 per cent. Pipe with either strength-level can be made in any standard wall thickness and in any diameter up to 10¾ in. o.d.

The strongest pipe now available for pipeline work is made to A.P.I. 5LX-52 specifications. Its ultimate is 66,000, its minimum yield 52,000 psi., and its elongation 20 per cent.

Welding . . . Besides its high strength, the outstanding feature of the new pipe is that welding it isn't too difficult. This doesn't mean it can be welded like Grade B pipe. It can be welded only with a low-hydrogen electrode. However, during cold weather, it won't require preheating like 5LX-52 pipe.

Will it be used? . . . So far no line has been laid with the new pipe. Even with its very high strength, it is unlikely that pipeline companies will make widespread use of it at first.

The big catch is initial cost. Wilder said the new pipe will cost about 2½ times as much as 5LX-52 which is the highest-priced line pipe now used. The 5LX-52 pipe has been on the market for years, but only a small percentage of annual pipeline mileage is laid with it.

This indicates that the new pipe will be used only in critical zones such as residential or commercial areas or for short distances on the discharge side of stations. Even here, a choice will always be made between the new pipe and a heavier-wall, lower-strength pipe.

However, the general pipeline trend toward higher pressures promises a gradually increasing market.

Welding trouble with 5LX-52 . . . Fred W. Zilm, Service Pipe Line Co., told the group that welding 5LX-52 pipe during cold weather is no cinch. His company ran into trouble last year during laying of Western Pipe Line Co.'s main line *(The Oil and Gas Journal, November 22, 1954, page 56)*.

His advice for cold-weather use of the pipe is:

. . . Preheat pipe before running root bead.

. . . Run the hot pass as soon as possible after the root bead.

. . . Complete all welds on the same day they are started.

Zilm said one of his company's greatest troubles was traced to leaving partially finished welds overnight. When filler and cap beads were run the next morning, severe underbead cracking occurred unless the pipe was heated again. Sometimes reheating didn't stop the trouble because the degree and uniformity of heat could not be controlled closely enough. Most of these "morning-after" cracks occurred in the top-quarter of the girth weld, showing that uneven heating from welding was the cause.

After the line was in place, his troubles were only beginning, Zilm said. A way had to be devised to make connections and repairs on the line with oil running through it. Cooling by the oil, which is at a temperature of about 32° F., prevents any preheating. So far, he said, the only satisfactory method is to use a low-hydrogen electrode. This has its drawbacks also, since only uphill welding is possible with that type rod.

Why change bevel? . . . Zilm questioned the merit of a proposed change in the degree of bevel on pipe ends. He said in recent tests 30-in. pipe that beveled 30° on one end and 37½° on the other was welded under the same conditions. The end with a 30° bevel required 13 oz. less welding rod and 19 minutes less welding time than the one with the larger bevel. Both welds passed all standard tests. Zilm asked, "Why go to 37½° when 30° will do the job?" Obviously, the greater bevel will cost pipeliners more in time and material.

Ahead for the refiner . . .

Car-Design Changes Mean New Fuels

DETROIT.—Oil men and auto makers got together here last week to take a look into the future. Some of the speakers indicated they see big changes ahead for refiners.

A single grade of gasoline by 1960 or 1962 was predicted by V. G. Raviolo, of Ford Motor Co. This, he said, will come about as low-priced cars raise their compression ratios and close the gap between them and the high-compression, high-priced cars. Raviolo's talk was before the lubrication committee of the American Petroleum Institute.

There will be other major developments, Raviolo said. For example:

. . . **Compression ratios** in the future will go beyond 10 to 1, possibly increasing to 12 to 1. Means must be found, he said, to produce gasolines that will rate well over 100 octane to fuel these engines.

. . . **Horsepower will increase** 30 per cent in the next 3 or 4 years in the low-priced cars. Luxury cars will increase their power proportionately.

. . . **A gas-turbine engine** will be in production probably by 1965 in the specialty car field. The specialty car, he said, "will be used to develop production techniques, to test the market, and to prove it in practice before a major production commitment is made."

The gas-turbine car could mean a revolution in both the auto and oil industries, Raviolo hinted.

"Within a few years after the first introduction of the gas-turbine engine, the major portion of automotive-engine production will be of the gas-turbine variety," he said.

Gasoline, he added, can fuel the gas turbine, but widespread use of the turbine will require new fuels. Especially important will be low volatility and low cost.

Synthetic lubricants probably will be required for turbines, Raviolo said. This is because turbine temperatures may be as high as 500° F. and lubricants must be stable at 650° F., he said.

Panel comments . . . Representatives of auto manufacturers had a variety of things to say about trends and developments in both the oil and auto industries. Here are some of them:

A. E. Cleveland, Ford Motor Co.: Ford is planning to take advantage of all of the increased octane numbers offered by new fuels. The company is looking forward to the day when current improvements in gasoline are "sufficiently universal among all leading brands" that Ford's job of designing engines will be much simpler.

J. M. Campbell, General Motors: "Nation-wide average for premium gasoline now stands at 94, whereas a year ago it was about 93 and a year before that 91 and a fraction. Last year we did not move much on compression ratio over the previous year, but this year we felt that an increase in compression ratio was justified by improvements in fuels now available."

J. M. Clark, Studebaker-Packard: Merger of these two firms means a future standardization of parts and assemblies, in some cases, which will have an effect on the oil industry.

C. M. Heinen, Chrysler Corp.: Chrysler has made no major changes in fuel and lubricant requirements during the year. It has made some changes in design intended to make servicing easier.

C. E. Burke, American Motors: American is recommending premium gasoline in its 1955 V-8 engine. Formerly only the optional cylinder head on the Ambassador required premium. "This premium-fuel recommendation was brought about by increased engine octane requirements through a higher compression ratio coupled with an increase in volumetric efficiency."

Automotive bouquet . . . E. M. Johnson, of The Texas Co., told the lubrication session that today's gasoline gives 2 miles per gallon more than gasoline of 9 years ago in level-road operation.

"This constitutes a remarkable gain and one which appears to be attributable to the automotive industry's conscientious attention to combustion chamber design, manifolding, valving, and carburetion, as well as to the petroleum manufacturer's rigid control of optimum gasoline volatility," he said.

Johnson said compression ratios rose from an average of 6.7 in 1946 to 7.6 in 1954. Horsepower in the same period climbed from an average of 105 to 151. In maximum horsepower available in an individual car, he added, it varied from 150 in 1946 to 235 in 1954.

There has been a sharp and steady gain in engine octane needs, accompanied by a consistent improvement in the antiknock quality of gasolines.

One-fuel significance . . . Raviolo's forecast of a single premium fuel came as no surprise to committee members who have been following trends in octane and compression ratio.

There already are strong indications that the lower-priced makes are going to move more and more into the premium-gasoline class. As compression ratios approach the ultimate limit, possibly above 12 to 1, the tendency will be for the lower ratio cars to close the gap. This may well come before then.

What did surprise some at the meeting was the fact that a Ford representative, rather than a General Motors man, spoke so boldly of the future. This probably means that Ford will press octanes more closely in the future. The current models show this.

It is logical to assume that if General Motors and Ford lean further toward premium requirements in their cars that Chrysler and others will follow suit. It then appears that not only must refiners gird themselves to make higher octane fuels, but to make them in much greater volumes.

Refiners To Meet

Annual W.P.R.A. session scheduled in San Antonio

SAN ANTONIO.—Eight technical papers and a progress report on the Western Petroleum Refiners Association-Bureau of Mines distillate fuels research project will be featured at the forty-third annual meeting of W.P.R.A. March 28-30 in San Antonio.

The W.P.R.A. also will elect officers and directors. Papers and their authors follow:

MARCH 28

"Fuel Knock Behavior in Passenger Cars," T. W. Warren, J. S. Wintringham, and C. R. Penninger, Ethyl Corp., Detroit; "Progress Report of W.P.R.A.-Bureau of Mines Distillate Fuels Research Project," F. G. Schwartz and C. C. Ward, U. S. Bureau of Mines, Bartlesville, Okla.; and "Introduction to Automotive Gas-Turbines," William A. Turunen, General Motors Corp., Detroit.

MARCH 29

"Asphalt Is a Petroleum Product," J. E. Buchanan, president, Asphalt Institute of America, College Park, Md.; "Fluid Cracking Catalysts Containing 25 Per Cent Alumina—Commercial and Pilot Plant Evaluation," B. H. Loper, American Cyanamid Co., New York; "Reforming," Henry W. Grote, Dr. Vladimir Haensel, and Melvin J. Storba, Universal Oil Products Co., Des Plaines, Ill.

MARCH 30

"Why Burn It Up?" W. K. Jackson, Cosden Petroleum Corp., Big Spring, Tex.; "Atmospheric Pollution," representative from the Western Oil and Gas Association, Los Angeles; and "Additive Trends in the Petroleum Industry," S. H. McAllister, Shell Development Co., Emeryville, Calif.

Stronger Union Forecast

O. W. I. U. president indicates organization drive in oil and chemical plants to follow C.I.O.-A. F. of L. merger

DENVER.—Merging of the A. F. of L. and C.I.O. will result in stepped up organization efforts in the oil and chemical industries, O. A. (Jack) Knight, president of the C.I.O. Oil Workers International Union, indicated last week.

Knight was a member of the C.I.O.-A. F. of L. unity committee which agreed to terms for unification of the two national labor organizations in Miami early in February. The merger is expected to be completed by the end of 1955.

"Streamlining of operations which now are duplicated, further reduction of disputes between unions, and concentration of resources in one federation will permit an increased amount of energies to go into organizing the unorganized workers," Knight said. "Both C.I.O. and A. F. of L. leaders have indicated the oil and chemical industries will be key industries for further organization."

O.W.I.U. status . . . He said there would be no change in the membership of O.W.I.U.

"The parent federations only will merge," Knight declared. "O.W.I.U. would neither lose nor gain members through the C.I.O.-A. F. of L. merger. It would continue to operate in the same fashion and to bargain with the same companies. Likewise, those few oil groups now in A. F. of L. would remain where they are and keep bargaining with their companies."

Knight added, however, that overlapping unions in the same industry would be encouraged, but not forced, to merge.

"A reasonable prediction is that most overlapping unions will eventually merge—some in a year or two, some in 5 years, and some perhaps never."

Less friction . . . The O.W.I.U. president also predicted that raiding and friction would gradually diminish.

"For the past 2 years, raiding between the two groups has been decreasing and was reduced sharply by the no-raiding pact reached several months ago—a pact which covered most, but not all, unions in C.I.O. and A. F. of L.," Knight said.

"It is reasonable to expect that raiding and other forms of friction will diminish even more sharply after C.I.O.-A. F. of L. merger."

Other benefits to be expected by O.W.I.U. under the merger, according to Knight, are unification of city and state federations and councils within 2 years after the C.I.O.-A. F. of L. merger, and improved and strengthened political action and lobbying.

Allowable Retained

Oklahoma to keep present formula another month

OKLAHOMA CITY.—Despite pipeline proration by two of Oklahoma's major crude purchasers, the Corporation Commission last week voted to retain its present production-allowable formula through March.

Actual production will average about 565,000 bbl. daily during March, officials estimate. This would be about 10,000 bbl. per day below the February allowable but 15,000 bbl. per day above the January figure.

The March production formula will retain the 25-bbl. daily maximum on a lease basis for wells in unallocated areas.

The "status quo" was recommended by Massena Murray, state conservation director. The 565,000-bbl. total was termed a "more realistic" figure than the 575,000-bbl. daily output estimated under the formula for February.

Daily allowable for March is 25,000 bbl. greater than the 540,000 bbl. market-demand estimate by the Bureau of Mines. Purchaser nominations for March totaled only 447,721 bbl. daily.

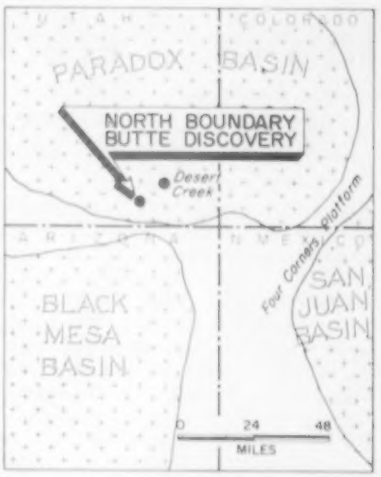
Warnings . . . The monthly allowable hearing brought threats of possible pipeline proration by two other big crude buyers—Skelly Oil Co. and Gulf Oil Corp. Skelly reduced its nominations from 7,500 bbl. daily in February to 5,800 bbl. for March.

"Continuation of present high allowables during March will force Skelly to adopt some form of pipeline proration," a Skelly official warned.

A Gulf spokesman said crude buyers may be forced to prorate their purchases if the production allowable continues to exceed nominations.

Pipeline proration in Oklahoma was started earlier this month by Rock Island Refining Co. and Anderson-Prichard Oil Corp. *(The Oil and Gas Journal, February 21, page 89).*

The commission indicated it may call an emergency meeting before its regular March hearing if further cutbacks are made by purchasers.



Utah Well Flows

Discovery is second made by Shell in Paradox basin

BLUFF, Utah.—Shell Oil Co.'s discovery in the Paradox basin in southeastern Utah flowed at the rate of 913 bbl. of oil with a small percentage of water per day.

The 1 North Boundary Butte, San Juan County, is flowing oil from the Paradox of Pennsylvanian age at 4,731-49 ft. The discovery is 5 miles southwest of Shell's Desert Creek discovery which opened first commercial oil production in the basin. The Desert Creek well was completed for a gage of 248 bbl. of oil per day on small choke.

The 1 North Boundary Butte is north of Boundary Butte field and is a few miles northwest of Arizona's sole producer at East Boundary Butte, also a Shell discovery last year.

The North Boundary Butte discovery is on Navajo Indian lands. Shell acquired extensive holdings through this area at an Indian sale 2 years ago.

Pipeline Clinics Set

CHICAGO.—A "pipeline problem clinic" will feature the eleventh annual conference and exhibition of the National Association of Corrosion Engineers at the Palmer House March 7-11.

The "problem" session of the conference will feature three clinics, on cathodic protection, internal corrosion, and protective coatings. Leaders of these clinics, respectively, will be C. L. Woody, United Gas Corp., Houston; Dr. Ivy Parker, Plantation Pipe Line Co., Atlanta; and L. A. Hugo, Phillips Petroleum Co., Bartlesville.

For the first time, attendance at these clinics will be limited to pipeline operating personnel. Equipment will be discussed on a trade-name basis and evaluated openly.

Import Estimates Rising

Latest reports to Railroad Commission indicate increase of 19 per cent in first quarter, 16.6 per cent in second

AUSTIN.—Importing companies again have raised their estimates of crude and product imports for the first quarter.

Last November, companies reporting to the Texas Railroad Commission estimated that their imports would average 1,160,000 bbl. daily for the first 3 months of this year. By December, the average had been raised to 1,184,000 bbl. daily, and another revision in January brought the estimate to 1,227,000 bbl. daily. February reports show another small gain, to 1,240,000 bbl. daily.

The latest average of company estimates for the first quarter is 19 per cent more than actual imports by these companies in the first quarter of 1954. Company forecasts for the second quarter show a gain of 16.6 per cent over the same quarter last year.

The figures reported to the Texas Railroad Commission do not include some imports by Government agencies and large consumer accounts.

For the first 11 months of 1954, company reports to the commission accounted for 98.6 per cent of all crude imports and 81.8 per cent of all product imports. If the same ratios hold true in the first quarter, total crude imports will average 759,000 bbl. daily and products 601,000 bbl. daily for a total of 1,360,000. On the same basis, second-quarter total imports will average 1,150,000 bbl. daily, including 770,000 bbl. daily for crude and 380,000 bbl. daily for products.

CRUDE AND PRODUCT IMPORTS*

(Thousands of barrels daily)

	1953 (actual)	1954 (actual)	Per cent change
October	905.7	984.3	8.7
November	1,019.5	1,040.2	2.0
December	1,045.4	1,205.3	15.3
Fourth quarter	989.9	1,077.0	8.8
	1953 (actual)	1954 (actual)	Per cent change
January	1,051.3	†1,224.9	16.5
February	1,091.7	1,268.6	16.2
March	989.3	1,229.8	24.3
First quarter	1,042.5	1,240.2	19.0
April	872.8	1,076.2	23.3
May	995.7	1,058.6	6.3
June	886.3	1,080.3	21.9
Second quarter	919.1	1,071.6	16.6

*From company reports to the Texas Railroad Commission. †Actual.

Company Reports Show Upward Trend

(Thousands of barrels daily)

	Actual		Estimated or forecast*				
	Dec. 1954	Jan. 1955	Feb. 1955	Mar. 1955	Apr. 1955	May 1955	June 1955
CRUDE—EAST COAST:							
Atlantic Refining Co.	51.5	60.4	61.8	61.8	61.8	61.8	61.8
Cities Service Co.	15.0	44.1	20.5	35.7	23.4	29.8	26.7
Eastern States Petroleum Co.	0.8	16.6	15.8	6.8	15.8	15.8	15.8
Gulf Oil Corp.	149.0	99.0	148.0	140.0	140.0	140.0	140.0
McBride Oil & Gas Corp.	4.0	4.0	4.5	6.5	6.7	6.5	6.7
Phillips Petroleum Co.	3.3	6.4	9.8	8.8	9.2	8.9	9.2
Sinclair Oil Corp.	70.8	65.6	66.0	66.0	66.0	66.0	66.0
Socony-Vacuum Oil Co.	83.4	82.4	78.0	80.0	80.0	80.0	80.0
Southwestern Oil & Refining Co.	7.2	7.4	4.0	6.8	3.7	(¶)	(¶)
Standard Oil Co. of California	64.4	85.5	92.0	92.0	92.0	92.0	92.0
Standard Oil Co. (Ind.)	13.0	9.5	14.6	13.2	17.0	16.5	17.0
Standard Oil Co. (N. J.)†	78.0	71.0	83.0	83.0	79.0	79.0	79.0
Sun Oil Co.	45.7	30.1	35.2	11.3	7.5	17.2	27.5
The Texas Co.	53.2	60.9	66.3	66.8	53.6	63.4	67.2
Tide Water Associated Oil Co.	9.9	11.0	9.4	10.8	7.7	10.8	11.0
Total East Coast	649.2	653.9	708.9	689.5	663.4	687.7	699.9
CRUDE—WEST COAST:							
Socony-Vacuum Oil Co.	16.6	30.2	23.0	27.0	27.0	27.0	27.0
Standard Oil Co. of California	30.8	8.9	16.0	16.0	16.0	16.0	16.0
The Texas Co.	9.5		6.1	12.1	7.8	12.0	12.0
Tide Water Associated Oil Co.	14.1	23.8	15.3	17.2	26.8	19.9	20.7
Total West Coast	71.0	62.9	60.4	72.3	77.6	74.9	75.7
Total crude	720.2	716.8	769.3	761.8	741.0	762.6	775.6
PRODUCTS:							
Asiatic Petroleum Co.	2.9	1.1	6.0	7.8	7.5	7.0	8.0
Cities Service Co.			2.5				
Eastern States Petroleum Co.	21.0	18.5	17.3	17.3	17.3	17.3	17.3
Gulf Oil Corp.	4.0	7.0	4.0	4.0	4.0	4.0	4.0
Shell Caribbean Petroleum Co.‡	169.0	172.0	171.0	150.0	95.0	70.0	80.0
Shell Oil Co.	17.9	23.7	30.7	18.5	21.9	17.8	21.9
Sinclair Oil Corp.	3.8	2.5					
Socony-Vacuum Oil Co.	10.4	7.8	7.8	7.8	7.8	7.8	7.8
Standard Oil Co. (Ind.)§	28.1	26.5	25.4	26.6	16.7	9.7	6.7
Standard Oil Co. (N. J.)†	228.0	249.0	231.0	231.0	159.0	159.0	159.0
The Texas Co.			3.6	5.0	6.0	3.4	
Total products	485.1	508.1	499.3	468.0	335.2	296.0	304.7
Total crude and products	1,205.3	1,224.9	1,268.6	1,229.8	1,076.2	1,058.6	1,080.3
Bonded fuel included‖	63.6	66.4	69.6	68.6	69.6	69.0	70.1

*From company reports to the Texas Railroad Commission. †Based on quarterly estimates. ‡Imported by independent distributors. §Received through suppliers who can furnish either domestic or foreign oil. ¶Unable to forecast. ‖Mostly duty free for bunkering ships in foreign trade.

Reforming Jobs Let

Socony awards contracts for two more Sovaformers

NEW YORK.—Socony-Vacuum Oil Co. is moving at a fast pace with its catalytic-reforming program. Two more Sovaformers have been contracted and a third is under construction. Two are now in operation.

A 9,000-bbl. per day Sovaformer will be built at the Trenton, Mich., refinery by Bechtel Corp. C. F. Braun & Co. has the contract to build another 9,000-bbl. unit at the East Chicago, Ind., refinery. Both will be completed in December.

Already under way is a 20,000-bbl. per day Sovaformer, being built at Paulsboro, N. J., by Fluor Corp., Ltd. Two units recently completed are a 6,000-bbl. per day unit at General Petroleum Corp.'s Ferndale, Wash., refinery and a 3,000-bbl. unit at Socony-Vacuum's Augusta, Kans., plant.

By the end of this year, Socony and affiliated companies will have a capacity of 47,000 bbl. per day in Sovaforming and 38,000 bbl. per day in Thermofor catalytic reforming. The latter represents two 19,000-bbl. units at General Petroleum's Torrance, Calif., refinery and the Beaumont, Tex., plant of Magnolia Petroleum Co.

More planned . . . This is by no means the end of the company's reforming

plans. Six more Sovaformers will be added to refineries in East St. Louis, Ill.; Casper, Wyo.; Buffalo; Brooklyn; Beaumont; and Torrance. While design capacity of all of these units has not yet been fixed, it is understood that they may swell the company's capacity in Sovaformers to 100,000 bbl. per day or more.

The program will put Socony-Vacuum in the front ranks on reforming and octane potential. The company, plus domestic affiliates, will have catalytic-reforming capacity of about 12.5 per cent of crude capacity by the end of this year. Before the current building program is over, the figure will probably approach 20 per cent.

Six records shattered as . . .

. . . Imports Hit All-Time High

TULSA.—All kinds of records were established by crude and product imports in December.

The new figures hung up during the month follow:

. . . Total imports reached the all-time high of 1,325,600 bbl. daily. The previous record of 1,211,700 bbl. daily was set in December 1952.

. . . A new record for crude imports was set with an average of 744,100 bbl. daily compared with the previous record of 729,200 bbl. daily in September 1953.

. . . Product imports climbed to a new high of 581,500 bbl. daily. The previous record was 562,000 bbl. daily in December 1952.

. . . Imports of Venezuelan crude totaled 11,993,000 bbl. for 386,900 bbl. daily for a new all-time record.

. . . Movement of Canadian crude to new refineries in Washington increased imports from Western Canada to 20,800 bbl. daily, a new record.

. . . Crude came from more different countries than in any other month in history. Supplying countries totaled 13, including the Neutral Zone.

December also saw Iran again shipping crude to this country.

Total imports for December represented an increase of 15.6 per cent over the average for November and about the same again over December of last year. Residual imports fell short of a new record by only 8,000 bbl. daily. The all-time peak was in December 1952 when the average was 538,000 bbl. daily.

Exports down . . . Exports for the month averaged 278,000 bbl. daily for a loss of 16.5 per cent from November. Crude exports were lower than for any other month in the past 35 years. The December rate of 11,200 bbl. daily was about the same as the average for 1916.

Exports of both kerosine and distillate fuel were lower than averages for either November or December last year.

Import-export data are compiled by the Census Bureau of the Department of Commerce.

IMPORTS INTO CONTINENTAL U. S.
(Thousands of barrels)

	Dec. 1954	Nov. 1954	Dec. 1953
Crude—			
Mexico	596	381	280
Colombia	713	819	1,100
Venezuela	11,993	11,370	10,405
Peru		110	
Trinidad	130	102	
Ecuador	100		
Kuwait	4,444	3,643	3,232
Saudi Arabia	2,214	2,328	2,960
Neutral Zone	189	217	
Iraq	119		
Iran	208		
Qatar	216	217	214
Canada	645	559	305
Far East	1,499	475	1,346
Total crude	23,066	20,221	19,842
Daily average	744	674	640
Products—			
Residual fuel	16,432	12,662	15,093
Other products	1,596	1,524	853
Total products	18,028	14,186	15,946
Daily average	582	473	514
Total all oils	41,094	34,407	35,788
Daily average	1,326	1,147	1,154

EXPORTS*

	Dec. 1954	Nov. 1954	Dec. 1953
Crude	348	1,047	1,378
Gasoline	2,236	2,175	2,401
Kerosine	95	427	623
Distillate fuel	1,846	2,682	2,337
Residual fuel	1,830	1,832	1,514
Lube oils	1,304	1,043	1,261
Other products	955	773	988
Total all oils	8,614	9,979	10,502
Daily average	278	333	339

*Excludes shipments to territories.

Research Plans Commended

DENVER.—The Colorado Legislature has commended Union Oil Co. of California for its plans to build a $5,000,000 shale-oil pilot plant near Rifle in western Colorado.

Closing of the U. S. Bureau of Mines experimental shale-oil plant in the same area June 30 has been recommended by the National Petroleum Council.

The Union plant may open the way to commercial development of an estimated 5 billion barrels of shale-oil reserves in 50,000 acres owned by the company near Rifle.

Gas Loop Planned

T.G.T. will have alternate route for New York market

HOUSTON.—Tennessee Gas Transmission Co. will have a 1,000-mile loop on the delivery end of its big system by next winter.

The company plans to start May 1 laying 248 miles of line east from Hebron, Pa., that will be the last link in the loop. This construction will extend T.G.T. lines across Pennsylvania and through New Jersey to near Greenwich, Conn., where it will connect with the south end of T.G.T.'s New England system.

Completion of the line also will mark T.G.T.'s entry into the lucrative metropolitan New York market *(The Oil and Gas Journal, January 3, page 63)*. Deliveries totaling 75,000 M.c.f. will be made to four utilities through the line. The deliveries will include 25,000 M.c.f. to Consolidated Edison Co. of New York; 25,000 M.c.f. to Public Service Electric & Gas Co., Newark, N. J.; 20,000 M.c.f. to Brooklyn Union Gas Co.; and 5,000 to Long Island Lighting Co.

Three underground storage fields in Pennsylvania and New York are tied in with the loop. These have been authorized by the Federal Power Commission. They will be developed with other firms and will provide gas for peak demand periods.

Other projects . . . The 248-mile, 24-in. line that will complete the loop is part of the company's 731-mile expansion program for the year.

The only larger project is 370 miles of 30-in. line proposed from Agua Dulce, South Texas, to Kinder, La. *(The Oil and Gas Journal, February 7, page 80)*. This project is planned as a substitute for looping part of the main system between Agua Dulce and Natchitoches, La. It is pending FPC approval.

Pipeline Financing Approved

WASHINGTON.—Financing plans for Pacific Northwest Pipeline Corp.'s natural-gas line from the San Juan basin in New Mexico to the Pacific Northwest were approved last week by the Federal Power Commission.

The FPC did not approve any financing plans involved in Pacific Northwest's agreement with Westcoast Transmission Co. to import Canadian gas as a part of the project. The federal agency has not yet given this part of the plan a stamp of approval.

Pacific Northwest will now take its plans to the Securities and Exchange Commission for approval of the fi-

nancing. The company plans to issue $120,675,000 in bonds to be sold to insurance companies; $17,220,000 in 6 per cent notes, convertible to preferred stock; and common stock totaling $25,126,000.

More Free Storage Expected

KANSAS CITY.—Great Lakes Pipe Line Co. is revising its demurrage charge system. The new plan will provide shippers more free storage time along the products system and should tend to stabilize prices.

Under the proposal, demurrage charges—the penalty for keeping products in the line too long—will not be levied until the products cause congestion. Shippers will be given a 5-day notice to move products out of the system. Demurrage charges currently are invoked 30 days after most products reach a terminal except for off-season buildups of gasoline and distillates.

Price cuts forced by meeting the present-day deadline will be eliminated under the new plan. This should lead to more stable prices since marketers will have more time to dispose of products.

The change is expected to go into effect April 1 if approved by the Interstate Commerce Commission.

Caustic Stripper Saving Money

LAKE CHARLES.—A new caustic stripper is giving Cities Service Refining Corp. an improved operation and reduced chemical costs at its refinery here.

The bubble-cap tower, used on a Unisol unit, separates caustic-treating solution from gasoline. It offers these advantages:

. . . **Caustic carryover** has been eliminated. About 75,000 lb. of caustic was lost monthly in the old stripper.

. . . **Maintenance costs** have been drastically cut. Corrosion repairs on the old tower hit about $20,000 a year. The new stripper is made of 7/16-in. thick monel. This will give long service under highly corrosive stripping conditions.

The bubble-cap design has licked two problems of the old stripper. Carbon Raschig rings used for packing in the old stripper crumbled and powdered, and the caustic solution picked up ring dust that plugged process equipment, causing emulsions. In addition to solving these problems, the design further shaved maintenance costs.

The sulfur content of treated gasoline dropped as much as 800 per cent during the first 6 months of operations of the stripper.

Industry Briefs

OKLAHOMA CITY.—Wyoming has joined the Interstate Oil Compact Commission. Gov. Milward Simpson has signed a bill recently passed by the Wyoming Legislature authorizing the membership. Wyoming, sixth ranking oil-producing state in the nation, will be the twenty-ninth I.O.C.C. member. There are 23 regular members and six associate members. The Wyoming bill prohibits the governor from entering into agreements for proration or limiting Wyoming production.

TOPEKA.—A 3 per cent tax on Kansas oil and gas production is proposed in a bill introduced in the legislature here. Backers of the bill think it would raise $9,000,000 a year. The bill is similar to others which have been introduced and defeated nearly every year for the past 20 years.

BATON ROUGE.—Louisiana's March allowable has been set at 684,412 bbl. daily, an increase of 5,455 bbl. over February. This increase was ordered to take care of new production.

AUSTIN.—Texas Railroad Commission has classified liquid sulfur extracted from sour gas as a petroleum product for motor-freight purposes. All truckers now authorized to haul petroleum products will be allowed to move liquid sulfur under the commission ruling.

DENVER.—The tax on oil and gas produced in Colorado would be more than doubled by a bill now before the legislature here. The measure calls for a flat 5 per cent severance tax on the value of oil and gas produced *(The Oil and Gas Journal, February 21, page 100)*.

TULSA.—Toklan Royalty Corp., Tulsa oil-producing company, has changed its name to Toklan Oil Corp. The company has production in Oklahoma, Kansas, Texas, Illinois, and New Mexico.

AUSTIN.—The Texas Senate last week passed unanimously a resolution urging Congress to pass legislation wiping out Federal Power Commission jurisdiction over wellhead prices of natural gas.

NEW YORK.—The nation's steel industry shipped a record 2,291,176 net tons of oil-country goods in 1954. This was 270,000 tons over the previous record set in 1953. The entire shipments of the steel industry totaled 63,152,726 tons, seventh highest in history.

Critics Hit FPC

Changes agency wants in gas act may be doomed

WASHINGTON.—The Federal Power Commission's requests for changes in the Natural Gas Act have run into a wall of criticism.

None of the 14 changes which Chairman Jerome K. Kuykendall laid before the House interstate commerce committee last month is new. All date back to the general gas-industry (G-580) investigation by the FPC in 1948. They have been put up to each succeeding Congress since then, without result.

The big criticism is that all the proposals strengthen FPC control. None of the suggestions made by the industry for lightening rate and certificate filings, speeding up their handling, or improving the commission's methods has ever been passed along to Congress.

Attorneys who practice before the commission say some of the changes are aimed at writing into law some of the things the FPC has done. That would indicate the commission has taken steps it is not sure would be sanctioned by the law as it stands.

Flood of bills . . . So far, the House committee has not indicated it will give serious attention to the FPC's requests this year. In a few weeks, the committee will be up to its neck in hearings on bills to exempt independent producers from FPC control. After that, it probably won't be inclined to go into other phases of natural-gas regulation, which would mean bypassing other bills in which committee members are much more interested.

The FPC has considerably less authority under the Natural Gas Act than it holds under the Federal Power Act. Most of its recommendations for changes in the gas act appear designed to bring it to equal footing with the power law.

Trade-Bill Fight Coming

WASHINGTON.—A reciprocal-trade bill passed by the House faces tough going in the Senate.

The bill gives domestic oil producers and manufacturers no more protection against unrestricted imports. Opponents of the administration bill, encouraged by the strong support they got in the House, are going to try to tack on many amendments.

Chairman Harry F. Byrd of the finance committee, which will handle the bill in the Senate, is going to try to keep hearings short. He will ask witnesses to limit themselves to points which were not brought out in the House hearings. Byrd's committee will probably start its hearings within a week or so, and is not expected to approve any changes in the bill. The big fight will be on the Senate floor when the bill comes up for debate near the end of March.

The threat of strong opposition to reciprocal trade may further delay release of the report of the Cabinet energy resources committee. The report has been held up for several weeks, presumably because its recommendations on oil imports might be interpreted to give support to the drive for an import quota.

Italian Investment Insured

WASHINGTON.—The Federal Operations Administration is guaranteeing a multimillion-dollar investment of Socony-Vacuum Oil Co., Inc., in Italy against expropriation or the tying up of profits.

The first phase of the insurance operation covers $8,400,000. Socony-Vacuum is making a cash investment in the fixed and working capital of its subsidiary, Socony-Vacuum Italiana S.p.A., and has transferred to it ownership of a refinery in Naples. Guaranties for other parts of the company's expansion in Italy are being worked out.

Socony-Vacuum is taking two types of insurance. One guaranty, with a maximum face amount of $5,600,000, insures that currency and exchange restrictions will not stand in the way of the company getting its money out. The other is insurance against expropriation in the amount of $2,800,000.

Temporary Tax to Stay

WASHINGTON.—Chances for repeal of the 20-year-old "temporary" federal gasoline tax faded last week.

Even the elimination of the emergency increase from 1½ to 2 cents a gallon was ruled out in the highway-construction program President Eisenhower sent to Congress.

The $101 billion 10-year program calls for a $31 billion federal investment. Eisenhower proposed most of this money be raised by special bond issues to be paid off with money from the gasoline and diesel oil taxes. Tolls also could be imposed in some instances, he said.

A sound highway program should stand on its own feet, the President told Congress. Highway users should provide the money for improvement and new construction.

There is strong Democratic objection to bond financing. The President did not insist that highways be built this way. He said only he is "inclined" to favor that method.

Price Rules Coming

FPC to make basic policy for gas-price regulation

WASHINGTON.—Basic rules for the regulation of prices for natural gas are expected to be announced by the Federal Power Commission before the end of March.

The commission heard several days of argument on the matter last month. Since then, Willard W. Gatchell, general counsel, has had across-the-table discussions with both producing and consuming interests.

Suggestions given Gatchell at those meetings are being passed along to the commissioners.

Big question . . . The big question to the producers is what form the commission will use to publish its policy. No order can be laid down that will apply to all producers under all conditions. The law grants all parties affected by FPC actions a right to be heard. That means, no matter how the commission packages it, the regulation of producers' prices will have to be on a case-by-case basis, both before it and in the courts.

The commission may go no further than listing the factors to be considered in passing on producers' applications for changes in prices. That would clear the air and give the producers an idea of what the commission considers relevant.

Independent producers insist that "value" is the only factor that can properly be used in regulating prices. Gas distributors and officials of the consuming states are equally insistent on more of the public-utility type regulation.

The consumer viewpoint is reflected in bills that have been introduced in Congress. One such measure would establish actual cost as the basis of rates on gas produced by pipeline companies. Another bill carries the same provision, but words it in such a way that it may be extended to all natural gas, including that produced by oil producers.

Gas Bill Is Nearer

WASHINGTON.—The Federal Power Commission, Interior Department and other interested agencies have been asked to say whether they are in favor of exempting independent natural gas producers from FPC control.

The House interstate commerce committee has asked for views on the several bills already introduced in Congress. Some of the bills call only for the exemption of independent producers. Others cover both independent and pipeline gas.

The bill which will be supported by the industry and congressional leaders has not yet been put in. It is being held up until some word comes from the White House, either in the form of recommendations of the Cabinet energy resources committee or comment by President Eisenhower.

The committee is making an early start on its study of the matter, however, so that no time will be lost getting to hearings when the bill is offered. It is hoped hearings can begin within the next 3 weeks.

Oil Compact Gets Backing

WASHINGTON.—The Federal Power Commission favors extending the Interstate Oil Compact.

The budget bureau has told the House interstate commerce committee it has no objection to the compact, and the Interior, State, and Justice departments are expected to give their approval soon. When these approvals are received, there will be little in the way of granting the requested 4-year extension.

Some objection is expected, chiefly from Rep. John Heselton of Massachusetts. But the Justice Department is expected to again clear the compact of any antitrust violations and clear the measure for approval by Congress.

Tanker Activity Up

WASHINGTON.—The Military Sea Transportation Service chartered 16 American-flag clean tankers for March voyages last month.

This was the largest number of vessels chartered in a long time. The step-up presumably was due to increased naval activities in the Far East. Only five clean and three black tankers were chartered for February.

The MSTS reported a decline in tanker rates. The February charters for clean tankers were made at 15 to 17½ per cent above the basic U. S. Maritime Commission rates. The March charters, it said, ranged from the basic rate to 15 per cent below.

WATCHING WASHINGTON

Bertram F. Linz

Echoes From Far East

The Formosa flare-up has convinced Washington there is a possibility a rash move by the Chinese Communists could bring another police action or even a real war.

That may be the reason why the Armed Services Petroleum Purchasing Agency is going into the market this week. The agency told the National Petroleum Council just a month ago its needs for this fiscal year had been met.

ASPPA will buy 2,765,714 bbl. of 115/145 aviation gasoline for lifting before June 30 and 782,000 bbl. of JP-4 jet fuel for delivery by the end of September.

Ominous noises in the Far East have had other echoes here. The plan to write standby price, wage and materials controls into the bill to extend the Defense Production Act may be dropped. Some officials and Congress members fear a wave of scare buying would result and prices would be forced up. Extension of the law may be delayed until later in the session.

At the same time, defense agencies are taking a new look at the readiness programs, just to make sure they are big enough. If standby controls are not provided, the Office of Defense Mobilization has bills ready to go to Congress at any time.

NPC May Be Target

A new drive to strip the National Petroleum Council of its independence may be in the making.

Chairman Emanuel Celler of the House judiciary committee says he may look over the industry advisory groups set up by federal agencies. His first target would be the Commerce Department, which is putting trade-association men on its committees. The practice had been barred for years by the Justice Department, and Celler thinks the ban should be continued.

The NPC would be almost certain to come up for discussion in Celler's investigation. It is the one exception to the Justice Department rule that advisory groups must have a government man as chairman, meet only at the call of the Government and discuss only subjects laid down by the Government. It took a White House decision to settle a fight over this point between Interior Secretary Oscar Chapman and Attorney General Howard McGrath in 1949.

Celler has always held out for strong control of industry groups. He is suspicious of "big business." He says many associations are controlled by one or a few large companies. He believes they might impress their views on the Government through association members on advisory committees. So he fears trade association membership on the committees might lead to monopoly.

U. S. Stalls U.N. Plan

An international organization to eliminate restrictive business practices is being pushed in the United Nations. The move won't get anywhere because the United States has refused to go along with the idea.

U.N. economic committees are supporting the proposal with reports on cartel and other arrangements. One report implies that oil prices in Europe would be lower if price-fixing was barred *(The Oil and Gas Journal, February 21, page 104)*.

Oil would be the big victim of international commodity control. This was tipped off in a committee meeting where a representative of the International Cooperative Alliance referred to the grand jury cartel investigation of 1952. The jury failed to establish a case, he said. But, he added, "there was no doubt that an investigation by an international body would have been more successful."

This new proposal, if adopted, could give the U.N. much of the control over the international oil industry that was proposed by a former State Department official some 7 years ago. But it also could be used to control international trade generally, and American businessmen are disturbed.

There is no opposition to the idea of freeing competition. But this idea is aimed at the U. S. and other countries which have effective antitrust laws. It would not apply to countries which do not have such laws. It would nullify the U. S. policy and laws designed to encourage overseas investment. Most important, it would deprive affected companies of the opportunity to be heard on U.N. decisions.

Wind, water, and ooze create . . .

Problems Peculiar to Gulf Area

. . . *and they are all costly*

F. Lawrence Resen

HOUSTON. — Problems peculiar to offshore operations are still a thorn in the side of operators in the coastal waters of the Gulf of Mexico.

They range from the need for a better way to get men and supplies to offshore platforms to the need for better mooring chains. Most problems are directly involved with dollars and cents.

There is plenty of room for whittling down costs, Mercer H. Parks, Humble Oil & Refining Co., told a local meeting of the American Institute of Chemical Engineers here last week. Parks, a supervisor of Humble's petroleum engineering division, said $600 million has already been spent offshore. More than 40 rigs are operating in the gulf waters and it costs about $125 million a year to operate them.

Sea bottom . . . A big problem, Parks said, is the instability of the floor of the gulf. Mud and sand bottoms extending along the ocean floor are too insecure to carry the load of drilling and production platforms. Heavy wave action exerts a severe horizontal load on these bottoms in addition to the normally expected vertical loads.

Parks said the situation is so critical some places that steel pilings are driven nearly 200 ft. into the mud to carry the vertical load. Some places operators have had to establish large bearing areas at or below the mudline to handle horizontal loads. These bottoms can carry the loads of mobile platforms in relatively light wave action, but even medium-height waves cause trouble.

What is needed is a simple, low-cost method—either chemical or mechanical—to make these gulf bottoms capable of carrying the loads. This would solve one of the most expensive problems facing offshore operators, Parks said.

Operating bases . . . The same method could simplify the construction of operating bases.

Dredges now supply dry ground for the bases. However, the seagoing craft used for transportation need deep channels which also have to be constructed and maintained at high cost.

Prevailing winds . . . Seagoing vessels to move men and materials to and from the locations account for a good share of costs. The normal prevailing winds throw up waves large enough to require sturdy, sea-going vessels for transportation. The waves are also frequently large enough to cause expensive delays in important operations. The transfer of men alone between boats and a platform is sometimes impossible.

Ever in the background are the tropical hurricanes which frequent the gulf during the fall. As the operations move farther and farther out into the gulf, the possibility that the hurricanes will wreak real havoc on equipment increases.

Corrosion . . . Cathodic protection for steel in the warm salt water offers a reasonable and economical solution below the zone in which air content in water is great.

Tests indicate cathodic protection is efficient even below the mud line. These tests have also done much to dispel the thinking that anerobic bacteria offer serious danger at and below the mud line, where the platforms are stress-critical, Parks said.

Anchor chains . . . Tenders moored near platforms, have a serious problem in the fatigue of anchor chains. These vessels are large—up to 325 ft. in length—and require forged steel chain up to 2 in. thick with a breaking strength as great as 500,000 lb.

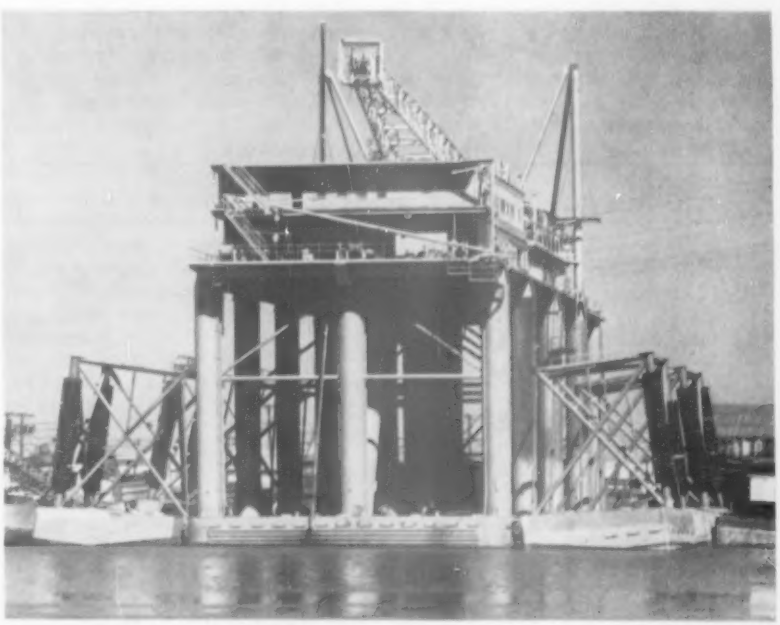
The investment in chain alone may run as high as $75,000 per vessel. A chain failure would allow the tender to swing into the platform, damage it, and possibly shear off the wells.

Chains are normally made in short lengths and then linked together. A "C," or hooked, connecting link with a bridging plate is used to make the connection.

Chain fatigue is accumulated even under low loadings, and failures occur at high wave and wind stresses. The failure has been chiefly in the connecting links.

Special links are possible to make, but the expense makes this undesirable.

One length can be forged at the plant. But the difficulties of handling several hundred feet of chain weighing 35 lb. per ft., are obvious.



New Barge on Shakedown Cruise

The latest addition to the growing fleet of offshore drilling barges was dedicated last week by American Tidelands, Inc., and is now shaking down in the Mississippi Sound. The barge, built by Alexander Shipyards, Inc., New Orleans, will drill its first well for Humble Oil & Refining Co. in the Eugene Island area 10 miles off Louisiana. The new submersible unit is 200 ft. long and 74 ft. wide, and has an over-all height of 93 ft. It can drill an 18,000-ft. well in water as deep as 45 ft.

Gulf Opens Unique Wax Plant

PORT ARTHUR, Tex.—The newest in wax-handling machines is turning out 140 quarter-pound cakes a minute at Gulf Oil Corp.'s refinery here.

In a continuous operation, the unit receives molten wax from a hopper, molds it in 8,640 moving pans, and either wraps the quarter-pound cakes individually or packages them four to a box. It is the only one of its kind.

Another unit in Gulf's recently opened molding and packaging plant molds wax into 11-lb. slabs for bulk purchasers.

In making the 4-oz. cake, Gulf puts only 3 oz. of wax in each molding pan at first. This is partly cooled and the pan moved to another spot where the fourth ounce is added. Without this system the wax would solidify into a cake with a concave center.

Gulf makes its 11-lb. slabs in a unit using 2,508 pans, each 12 by 19 in. and 2 in. deep. These are arranged into groups of six which move side-by-side on flat trays at a rate of 400 ft. per hour.

The pans, after filling, are carried into a cooling chamber where air between 15° and 20° F. is circulated. The wax contracts as it hardens. When the pans are inverted as they leave the chamber, the slabs drop readily to conveyor belts below. The slabs are inspected, spot-weighed, and packaged automatically, five slabs to a carton.

Record Bids Made

Louisiana sale brings over $21 million for new high

BATON ROUGE.—Three records were snapped here last week in the spirited bidding for 34,777 acres of state-owned land leased by the State Mineral Board.

The records set at the sale include:

... **The $21,173,551 total** surpassed the single-day mark set last July when $16,081,333 was paid in bonuses.

... **A $6,572,000 bid** by The California Co. is the most ever paid for a state lease in Louisiana. This topped the $5,265,000 paid September 15 by the same company.

... **The $608 average per acre** for the 34,777 acres is a new high average. The previous high was $550 an acre, also set in September.

The California Co. made its record bid for a 4,687-acre tract in the South Pass area at the mouth of the Mississippi River off Plaquemines Parish. Shell Oil Co. paid a bonus that topped the September high, but fell short of The California Co.'s bid. Shell paid $6,373,000 for a 4,075-acre inland lease in Plaquemines Parish near Garden Island Bay. This bid beat out The California Co., which bid $5,511,000 for the tract.

The highest per-acre bid made at the sale was $1,700 an acre paid by Continental Oil Co. for a 45-acre inland tract in Acadia Parish. The bid totaled $77,850.

The leases will run for 5 years. They carry a one-sixth royalty payment rather than the normal one-eighth royalty.

In addition to The California Co. lease, two other offshore leases were granted. Shell won a lease on 4,812 acres in the South Pass area with a bid of $2,857,000 and The California Co. was top bidder for another South Pass area tract with a bid of $101,000. The latter covers 2,500 acres.

Other main inland leases were: Humble Oil & Refining Co., $3,521,520 for 2,920 acres and The California Co., $538,000 for 1,185 acres, Plaquemines Parish; The Texas Co., $350,558 for 3,283 acres and $282,967 for 2,650 acres, St. Mary Parish; and Southern Natural Gas Co., $254,856 for 2,296 acres in St. Mary and New Iberia parishes.

Offshore Activity Continues

BATON ROUGE.—The State Mineral Board issued 15 geophysical permits in January covering every area offshore in Louisiana waters except Bay Marchand.

At the same time, the Louisiana conservation department revealed 44 rigs were operating in Louisiana waters in January. This is almost double the number drilling in offshore areas in January 1954.

Texas Allowable Boosted

Railroad Commission approves crude output of 3,279,263 bbl. per day in March, second highest total in history

AUSTIN.—Texas oil wells will speed up next month the fast production pace they have held since December.

The Texas Railroad Commission again passed over recommendations of most of the crude-oil buyers and hiked the state-wide production allowable for March to 3,279,263 bbl. daily.

This is 50,563 bbl. higher than the February 5 allowable, and 37,825 bbl. daily higher than the initial allowable set for February.

The new figure is the second highest in Texas history. It is topped only by the 3,387,297-bbl. November allowable of 1952.

Only three purchasing companies asked for the 18 producing days fixed by the commission for March. These were Atlantic Refining Co., Sun Oil Co., and Shell Oil Co.

Twice as many sought a 17-day producing rate, including Gulf Oil Corp., Magnolia Petroleum Co., Humble Oil & Refining Co., Sinclair Oil & Gas Co., The Texas Co., Phillips Petroleum Co., Continental Oil Co., and Stanolind Oil Purchasing Co.

Adoption of the 17-day rate would have meant a cut of roughly 80,000 bbl. daily from the February 5 allowable.

Low demand forecast . . . Companies urging the lower rate based their argument on average seasonal-demand trends which show that demand usually starts dropping rapidly in March. Increases in crude and products stocks at this point are dangerous, they say.

The commissioners thought otherwise. E. O. Thompson said stocks now are about 260,000,000 bbl. A recent study by the American Petroleum Institute on crude availability showed 68 per cent of total stocks tied up in pipeline fill, tank bottoms, and minimum working stocks of refineries. This leaves only 32 per cent or 83,200,000 bbl. for actual refinery runs, he said.

With refinery runs averaging 7,384,000 bbl. daily, this is only a 13-day supply of available crude, Thompson said. Stocks thus are low when compared "with what we have been advised is adequate."

Many of the purchasers raised their eyebrows, he said, when the commission raised allowables in January but cold weather took 17,000,000 bbl. out of stocks. Thompson suggested that gasoline stocks would not be climbing so fast if refiners would make more fuel oil instead of gasoline. He said one company has increased gasoline sales so far this year 16 per cent above last year and suggested that this might be due to good salesmanship.

MARCH ALLOWABLES

District—	March	Inc. from Feb. 5
1—Southwest	60,566	490
2—Gulf Coast	158,860	2,480
3—Gulf Coast	498,746	4,408
4—Southwest	275,718	3,650
5—East Central	52,983	—3,122
6—Outside East Texas	138,052	3,535
6—East Texas field	240,087	919
7-B—West Central	188,547	3,198
7-C—West Central	227,822	3,894
8—West Texas	1,044,764	26,035
9—North Texas	274,423	4,184
10—Panhandle	118,695	892
Total	3,279,263	50,563

More injection sought in . . .

. . . "Phillips Case" Field

DALLAS.—Magnolia Petroleum Co. and other operators in La Gloria field have agreed to unitize oil production and carry out pressure-maintenance operations in several of the field's 21 oil zones.

The first conflict involving a state and the power given the federal Government in the Phillips case grew out of a gas-injection program in the field's gas-producing zones.

Initial plans for the oil-recovery program were laid before the Texas Railroad Commission last week. The program, which includes gas injection, is expected to net an extra 5,000,000 bbl. of oil from the South Texas field.

A spokesman for Magnolia said all operators except Skelly Oil Co. have signed the operators' agreement. Skelly, which has a 20-acre tract in the field, has no objection to the program, he said. Almost 90 per cent of royalty interests have signed the royalty owners' agreement.

Eventual cost of the program will probably run around $2,000,000, Magnolia said.

History and controversy . . . La Gloria field, straddling the Brooks and Jim Wells county line, was discovered in March 1939 with the completion of a gas producer. It is a domal structure trending northeast-southwest. Average closure is about 400 ft. Gas production was unitized about a year after the discovery. The field has 35 gas-producing zones in the Frio and Vicksburg transition zones from 5,100 to 8,000 ft.

Cycling was started in a number of these zones in 1941 and was extended to other zones late last year with the approval of the commission. The expansion of cycling was pushed over strong protests from Texas Illinois Natural Gas Pipe Line Co., purchaser of gas in the field. Texas Illinois argued that cycling already had cut gas deliveries far below contract volumes.

The pipeline appealed to the Federal Power Commission to force delivery of the gas which would be cycled, bringing about the conflict over state and federal gas-production powers *(The Oil and Gas Journal, November 1, 1954, page 69)*. This conflict has not been resolved.

The cycling program in the La Gloria gas zones is expected to result in recovery of roughly 5,600,000 bbl. of additional gas liquids. This would push total pressure-maintenance recovery from both oil and gas programs to between 10,000,000 and 11,000,000 bbl. of liquid hydrocarbons.

Processing Tax Proposed

AUSTIN.—If a bill introduced in the house here last week becomes law, Texas refiners and gasoline plant operators will pay a 1-cent-a-gallon processing tax on all combustible condensates they make.

The bill, fathered by Rep. Jerry Sadler would replace the present 4-cent tax on every gallon of gasoline sold in Texas. Sadler said it would bring in about $160,000,000 a year—about $47,000,000 more than the gasoline sales tax. Industry economists question Sadler's figures.

Taxable products would include natural and casing-head gasoline and L.P.G. as well as motor gasoline, avgas, kerosine, naphthas, etc.

Refinery To Close

Magnolia announces plans to sack Fort Worth plant

FORT WORTH.—This city's standing as a refining center will take another big drop this spring, the second within a year.

Magnolia Petroleum Co. will close its 13,320-bbl. refinery here May 1. This will leave Fort Worth with only one plant, a 7,500-bbl. refinery operated by Premier Oil & Refining Co.

Magnolia said its 40-year-old refinery has been losing money for several years. In recent months, special blending agents and premium gasolines had to be shipped from the company's Beaumont plant to upgrade local gasoline to meet present quality requirements. The refinery went on stream Christmas Day, 1914.

John W. Newton Magnolia's vice president and manager of refining, said it "would be an uneconomic, duplicate operation to build and maintain Fort Worth facilities capable of making independently these high-quality products." Another reason for the shutdown, Newton said, is that the location is not as favorable as it once was for product distribution.

Gulf Oil Corp. closed its 9,435-bbl. plant here early last summer for the same reason—the spectacular surge in octane ratings has made it a tough proposition for the small inland refinery to stay out of the red.

Thermal facilities at the plant include 8,325 bbl. of cracking, 1,998 bbl. of reforming, and 5,883 bbl. of coking capacity daily. It could produce 1,887 bbl. daily of cat-poly gasoline and 127 tons of coke per day.

Magnolia will use the plant site for a small-scale terminal operation. Dismantling will start soon. Plans for disposing of the equipment are not complete, but some may go to the big Beaumont plant, which has a crude-charge capacity of almost 200,000 bbl. daily.

Two Water Floods Approved

AUSTIN.—Two water floods were approved by the Texas Railroad Commission last week.

Stanolind Oil & Gas Co. received permission to conduct a pilot flood in Foster field in Ector County, West Texas. This big pool produces from the Grayburg at about 4,100 ft. It is nearing the end as far as primary oil recovery is concerned. Its 34,000 acres boast 657 wells with a total allowable of about 22,000 bbl. daily.

More than half of the wells—374—are classed as limited capacity, 235 as marginal, and 10 as having no allowables. Only 38 are considered capable of producing the top allowable.

Sun Oil Co.'s request to start a flood in the West sand of Midfields field in Matagorda County also was approved. The project would recover more than a million barrels of additional oil. There are 38 wells on 2,450 acres in Midfields producing under a combination of solution-gas, gas-cap expansion, and natural-water drives.

Gas already is being cycled into the gas cap. This would continue and Sun would inject 3,500 bbl. of water daily through a single well into the West sand below the oil-water contact at 9,128-50 ft. and 9,158-74 ft.

WEST COAST

Oil Bills Face Battles

Resort cities oppose measure opening California tidelands to more development; Long Beach may lose big harbor fund

SACRAMENTO.—Two major battles concerning California's state-owned submerged lands are expected to come up when the legislature resumes activities here this week.

One fray will involve the degree to which leasing and development will be permitted. Bills sponsored by the petroleum industry, needless to say, are much more liberal than those sought by coastal groups which fear the beauty of their beaches will be marred.

Another battle is expected over ownership of oil funds from tidelands granted certain cities by the state. Only Long Beach is involved at the moment, but stands to lose $160,000,000. The huge oil funds it has accumulated from its harbor oil properties properly belong to all Californians rather than the city, certain legislators believe. The industry will take no part in these proceedings.

Bills introduced by Assemblyman Joseph Shell, Los Angeles, during closing moments of the first half of the session are those being backed by the oil industry. Principal amendments to the Public Resources Code proposed by these bills would:

. . . **Revise provisions** which limit leasing and development to situations where drainage exists. Shell's bill proposes that drilling can be carried out from piers, platforms, or other fixed or floating structures, as well as from upland locations with slant holes.

. . . **Remove some discretionary** authority from the State Lands Commission, which administers offshore lands. This bill also makes certain rights and obligations of the lessee more concrete by including them in the code.

Property values of coastal cities also are protected in the measures.

It is proposed that the commission hear any objections to offshore leasing. If the commission finds that coastal recreational or residential areas will be impaired by oil activities, the leases will not be granted. Or if leases are granted, development will be under conditions that will not impair or interfere with beach activities.

Royalties . . . Another measure introduced by Shell covers cash-bonus bidding with fixed royalties. A fixed flat royalty of 16⅔ per cent would be paid if the lands are on a known geologic structure. For lands not on a known structure, a fixed flat royalty of 12½ per cent would be required.

Transferring leases . . . Another proposal would permit a company to assign a state lease in whole or part without consent of the commission. It provides that drilling must start within 5 years if the lands are not on a known structure and 3 years if the lands are on a known structure.

Long Beach rallying . . . A bill introduced by three mid-California assemblymen at the close of the first half session provides for the transfer to the state of all revenues realized by Long Beach from the tidelands "not expended for the use and purposes of the trusts imposed by the granting act, as well as all future revenues derived from said lands."

This bill has the city fathers aroused. Long Beach in 1911 was granted title to submerged lands within its city limits out to the 3-mile limit. A qualification was that all funds derived should go to establish a port and other harbor facilities. Since funds accumulated faster than needed for port purposes, the legislature in 1951 authorized Long Beach to spend half of existing oil funds for upland improvements.

Now that the city no longer needs these funds for the purposes set forth in the original grant, backers of the bill say remaining funds should go to the state. About $160,000,000 is at stake.

CRANE VALVES have longest life in this sulphur pit

THE CASE HISTORY— Leakage in steam lines to sulphur pit heating coils was hindering operations at International Minerals & Chemical Corp. plant at Lockland, Ohio. The condition prevented servicing of traps, strainers and the heating coils.

Valves that leaked beyond repair after as little as 6 months' service were the source of the trouble. Their seating as well as packing failed to stand up.

In January, 1953, after trying other types, Crane 14½P Plug Type Disc Globe Valves were installed. Today, they're still giving excellent service at low cost. Recently, the steam piping was completely replaced—the Crane valves were repacked and put back in the lines. That's all the maintenance they needed after 18 months in this severe service.

Crane 150-Pound No. 14½P Plug Type Disc Brass Valves

Long-wearing, hard seating surfaces in a rugged, well-proportioned, Crane-designed body make these valves exceptionally suited for steam and other severe services. Consult your Crane Catalog or your Crane Representative.

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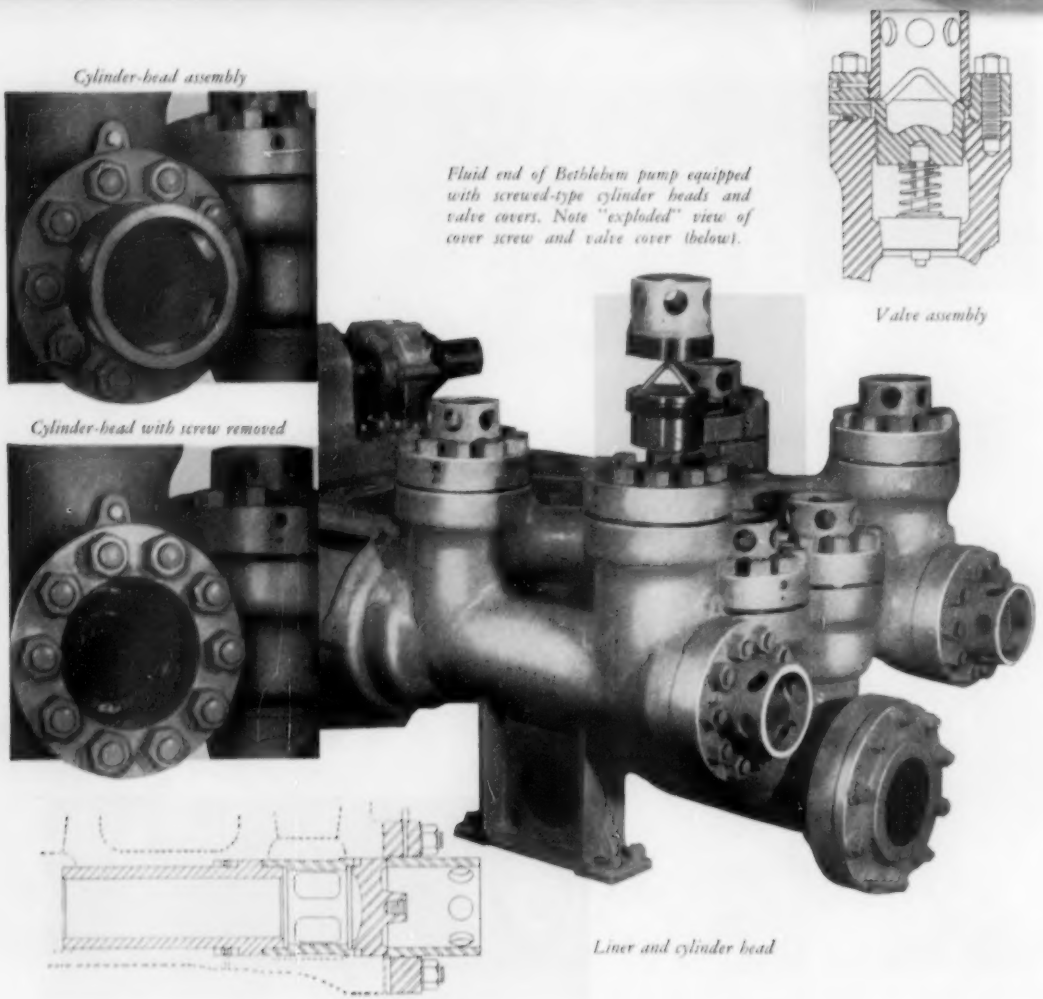


Cylinder-head assembly

Cylinder-head with screw removed

Fluid end of Bethlehem pump equipped with screwed-type cylinder heads and valve covers. Note "exploded" view of cover screw and valve cover (below).

Valve assembly

Liner and cylinder head

Here's how you save time

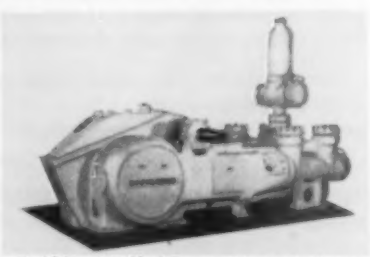
with Bethlehem screwed-type cylinder heads and valve covers

All five sizes of Bethlehem slush pumps can now be furnished with screwed-type cylinder heads and valve covers as optional equipment.

As shown in the illustrations, hollow cylindrical screws, threaded at the base, mate with threaded adapter rings. You remove them by a few easy turns, and thus have quick access to cylinder and valve assembly parts. No longer is it necessary to waste time removing cover nuts, and putting them back in place later on.

The screwed-type cylinder-head design greatly facilitates the servicing of packing, liners, pistons, piston rubbers, and rods. The valve cover arrangement materially reduces the time needed to service valves, seats, rubbers, and springs. The nuts that clamp the adapter rings in place remain permanently tightened, though they can be removed, of course, if need arises.

This optional screw-type design is but one of the many fine features of Bethlehem slush pumps. Offered in sizes for all drilling depths, the pumps are unusually powerful units with high volume capacities. The *smallest* will accommodate a 7¼-in. liner; the other four sizes, an 8-in. liner. Strokes range from 12 to 18 in.



Bethlehem 600 Slush Pump with standard covers

Full particulars are available on request. For engineering details, phone or write our nearest office.

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BETHLEHEM STEEL

Budget Announced

Colorado Interstate plans include 365-mile gas line

COLORADO SPRINGS, Colo. — A 1955 construction and expansion budget of more than $35,000,000 was announced last week by Colorado Interstate Gas Co.

W. E. Mueller, president, said the largest single item in the budget is $22,600,000 set aside for construction of a 365-mile natural-gas pipeline from Rock Springs, Wyo., to Denver. Colorado Interstate plans to begin building the line this year, but the actual starting date depends upon the start of construction on Pacific Northwest Pipe Line Co.'s 2,000-mile, $160,000,000 line from the San Juan basin of southwestern Colorado and northwestern New Mexico to the Pacific Northwest *(The Oil and Gas Journal, December 20, 1954, page 58).*

The Pacific Northwest line will run north from the basin through Utah, touch the southwest corner of Wyoming at Rock Springs, and extend northwest to Washington and Oregon. Colorado Interstate's 22-in. line will tap the trunk line at Rock Springs and carry 100,000,000 cu. ft. of gas daily into the Denver area.

Exploration planned . . . Colorado Interstate also will spend $3,000,000 for gas-well development and exploration on company-owned acreage in the Panhandle gas field of Texas and Keyes gas field in Oklahoma and elsewhere. An additional $4,200,000 is earmarked for extension of its gas-gathering facilities in both the Panhandle and Keyes fields and in the Hugoton and Greenwood gas fields in Kansas.

Balance of the $35,000,000 construction budget will be spent on additions to company properties and facilities in the Denver, Pueblo, and Arkansas Valley regions of Colorado.

Drilling Program Outlined

BILLINGS, Mont.—The Mon-O-Co Oil Corp., Billings, has announced a $3,000,000 development program for the Fertile Prairie area in Fallon County east of Baker, Mont.

Joining Mon-O-Co. in the program are the Ajax Oil Co. and other independent operators. The agreement covers about 1,000 acres in the Mon-O-Co lease block.

Mon-O-Co. recently made an important discovery east of the crest of the Cedar Creek anticline near Baker. It is considered the first discovery of stratigraphically trapped oil in the Williston basin.

Six drilling tracts in the area have been blocked out for test wells and intermediate drilling.

The discovery, 1 Ferguson-Goldin, is producing from the Red River horizon and by the end of January had produced 11,241 bbl. of oil. The confirmation well is below 9,400 ft. and probably will be completed in the same horizon.

Proration Bill Revised

LINCOLN, Neb.—A Nebraska legislative bill to create a State Oil and Gas Conservation Commission is being revised to eliminate a provision for market-demand proration of oil and gas production.

The change was announced by Sen. Donald McGinley after independent oil and gas producers of western Nebraska began to unite in a drive to oppose the bill. The independents contended the commission's power "could be used to stifle and discourage the development of oil and gas production. . . ." They said the bill did not provide adequate protection for independent oil producers.

McGinley said another change being made in the bill would allow the commission to hire an outside executive director, instead of being forced to name the state geologist as head of the commission. The state geologist would become an ex-officio member, instead.

Well Spacing Set

DENVER.—Forty-acre spacing has been ordered for three more Colorado oil fields by the State Oil and Gas Conservation Commission.

Affected is production from the "D" sand of the Jackpot field in Morgan and Weld counties, the "J" sand of the Rago-North field in Washington County, and the "J" sand of the Plum Bush Creek field, also in Washington County.

Natural-Gas Line Planned

DENVER.—Natural Gas Producers, Inc., will build 61 miles of pipeline from northeastern Colorado to Denver, giving Denver its first natural-gas service from that section of the state.

The company, a subsidiary of Colorado Interstate Gas Co., will obtain gas from Fort Morgan, Adena, Bobcat, Little Beaver, and Badger Creek fields. The $1,374,000 project will include a gathering system and 48.7 miles of 10-in. main line. The main line will connect with the Denver-Hugoton pipeline owned by Colorado Interstate.

Gas from two gasoline plants, one near Adena field and the other near Little Beaver field, will be purchased by Natural Gas Producers.

The Colorado Public Utilities Commission has approved the project. Work is expected to be started soon and completed within 60 days.

Lease Laws Doomed

Action on controversial Montana bills postponed

HELENA, Mont.—The Montana House of Representatives has killed two bills which would have revised the terms of state oil and gas leases.

Further action on both bills was postponed indefinitely by votes of 50-42.

One of the bills would have repealed the state's controversial 1953 law which authorized leasing for an indefinite term. The other would have allowed a lease to remain in effect for 40 years if oil and gas were produced in commercial quantities at the end of the first three 10-year periods.

A December 10 decision of the Montana Supreme Court holding the 1953 law unconstitutional has been appealed to the U. S. Supreme Court. The ruling returned leasing to a 20-year basis.

The successful motion for indefinite postponement was offered by Rep. Sumner Gerard, Madison Republican. He said the proposed measure "would prohibit the U. S. Supreme Court from acting on the appeal."

Still pending in the Montana Legislature is a bill that would set the nondrilling penalty on state lands at $1 per acre for the first 4 years of a lease. The penalty would be increased to $1.25 for the fifth and sixth years and $1.50 thereafter.

Three-Way Merger Planned

DENVER.—Stockholders of Crusader Corp., Niobrara Oil, Inc., and Empire Oil Corp. will be asked to approve merging of the three companies into Crusader Oil & Uranium Co.

The three firms own oil and gas leases and uranium holdings in Colorado, Wyoming, Utah, and New Mexico.

Crusader stockholders meet March 17 and the Niobrara March 24. The Empire meeting will be set later.

James R. Macon, Denver, president of Crusader, said the new firm, incorporated at $1,500,000, has 150,-

000,000 shares of one-cent par value stock. Shares will be issued one for one for Niobrara's outstanding 30,600,000 shares, Crusader's 34,000,000, and Empire's 29,400,00—a total of 94,000,000, leaving 56,000,000 shares unissued.

Lease Sale Cancelled

WASHINGTON.—The Bureau of Land Management cancelled the sale of three leases on 480 acres of Colorado oil lands last week.

It suddenly was unsure whether the federal Government has title to the oil it was selling.

The lands are on the structure of Bell Rock field in Moffat County, 8 miles west of Craig. What appeared to be a good title to the underground resources suddenly was clouded after the call for bids was sent out.

All bids are being returned. The bureau will hold the sale up until the question of title is settled.

150 Wildcats Planned

DENVER.—Jack Davis, New York hotel man and oil operator, last week announced plans to drill 150 wildcat oil tests during the remainder of 1955 in the Denver-Julesburg basin at an estimated cost of $3,000,000.

Davis said the wildcat ventures will be drilled in northeastern Colorado, southwestern Nebraska, and southeastern Wyoming.

He is an officer of both the Ryan Oil Co. and the Davis Oil Co. The two companies, Davis said, have made eight discoveries in Colorado and Nebraska in the last 4 months.

Nebraska Land Surveyed

ALLIANCE, Neb.—A geologic survey of about 200 sq. miles of land between Alliance and Bridgeport, Neb., is being undertaken in an effort to find oil on the northern fringe of the Julesburg basin.

The survey crew was hired from Precision Exploration Co., Tulsa, by an independent producer, E. D. Feldman Oil & Gas Co., Dallas. The survey will take about 6 months.

80-Acre Spacing Ordered

HELENA, Mont.—An 80-acre spacing pattern has been ordered for the Fertile Prairie field in Fallon County, Montana, by the state Oil and Gas Conservation Commission.

An emergency order issued by the commission would prevent "possible waste of oil or gas" from the field pending hearings on well spacing late this month and early in March.

CANADA

Ammonia Plants Proposed

EDMONTON.—The ammonia boom is on in Western Canada. It appears that two plants based on natural gas may be built in Manitoba and Alberta.

Northwest Nitro - Chemicals, which has been planning a plant for southeast Alberta for several months, now is reported to have completed financing arrangements and soon should officially announce plans to get into ammonia and ammonium-nitrate production *(The Oil and Gas Journal, February 21, page 99)*.

New British Dominion Oil Co., Calgary, and Commercial Solvents Corp. will hold a majority interest in the new venture. The ammonium nitrate operation will employ the Commercial Solvents process which was first put to commercial use last year at the company's Sterlington, La., plant.

A second group of Canadian and U.S. investors was recently incorporated as Canadian Hydrocarbons, Ltd. This company plans to build an ammonia plant near Winnipeg. Formed by Winnipeg & Central Gas Co., the firm expects to get into the L.P.G. and petrochemical business. Ammonia and nitrogen fertilizers using natural gas as a starting point are under consideration.

Sour-Crude Price Reduced

CALGARY.—Imperial Oil Ltd. has reduced its purchase price for light sour crude oil in western Canada by from 2 to 24 cents per barrel.

The price reduction affects only fields producing crude containing 0.5 per cent or more sulfur. A week earlier, the company boosted its price for Pembina crude 12 cents per barrel *(The Oil and Gas Journal, February 21, page 99)*.

Fields affected by the new price change, and the reduction per barrel, include Duhamel and New Norway D-2, 2 cents; Excelsior and Alida, 4 cents; New Norway D-3, 8 cents; Virden, 13 cents; Fenn and Big Valley, 14 cents; Daly, 20 cents; and Ellerslie, 24 cents.

Alberta Has Big Discovery

EDMONTON.—Alberta's best discovery of the year has a rated initial potential of 600 bbl. of oil per day.

The strike is Canadian Gulf Oil Co.'s Clear Hills wildcat in northwestern Alberta, 45 miles northwest of the town of Peace River and 67 miles east of the British Columbia border. Production is from granite wash, through 12/64-in. choke. Flow rate over a 5-day period was 600 bbl. daily. Depth of the well is 6,938 ft.

Regent Drilling Co., Ltd., has moved rig from the discovery to 14-10 Clear Hills, the first follow-up to the discovery. The discovery well, 4-15, is in LSD 4, 15-88-2w6. The offset is in LSD 14, 10-88-2w6, ⅛ mile southeast.

Canadian Permits Offered

REGINA.—Bids for exploration permits on more than 750,000 acres of crown lands in Saskatchewan will be opened here March 16.

Nine blocks will be offered by the Saskatchewan Department of Mineral Resources in the sale, announced last week. The department reserves the right to reject any bids.

Sealed bids are to be accompanied by the full amount of the purchase price together with the first year's rental at the rate of 2 cents per acre.

Ontario Plant Expanding

SARNIA, Ont.—A carbon monoxide steam generator, first of its kind in Canada, will be installed by Canadian Oil Refineries, Ltd., at its refinery near here.

The new unit is part of a $3,000,000 expansion to boost the plant's capacity from the present 25,000 bbl. to about 30,000 bbl. per day by early 1957. The generator will recover energy in steam form through burning of cat-cracker regenerator gas.

Merger Plan Approved

CALGARY.—Officers of West Territories Oils, Ltd., have approved a move to turn over all assets of their company to Canadian Homestead Oils, Ltd.

Shareholders in West Territories will receive one share of Canadian Homestead for every 10 they hold in West Territories.

Calgary Firms to Merge

CALGARY. — Two Calgary independents, Alberta Pacific Consolidated Oils, Ltd., and Sunset Oils, Ltd., will hold special shareholders' meetings here March 7 to effect a merger of the two companies.

Under terms of the merger, one share of Sunset will be exchanged for one share of A.P. Con. The latter company will absorb Sunset.

Formosan Pace Increases

Wildcat drilling and the island's first seismic survey highlight program started by government-owned firm

FORMOSA may capture some oil headlines during 1955 as well as play a big role in the international political scene.

The island off the coast of Red China got a shot in the arm last year with the discovery of its second commercial oil field. But, there was a 50-year lapse between the first and second fields. The government-owned Chinese Petroleum Corp. has an exploration program under way that is aimed at taking much less than 50 years to come up with a third field.

The program on the island includes:

. . . Drilling a wildcat a few miles southwest of Taipeh, which is on the northern end of the island. Taipeh is the capital of Formosa.

. . . Starting the first seismic survey ever made on the island. This work began in January in the southwestern coastal plain area in the vicinity of a prominent gravity anomaly where C.P.C. drilled a wildcat in 1948. The test was abandoned when it was found to be off structure.

. . . Development drilling in the Chutauchi South Culmination field discovered last year in the southern part of the island *(The Oil and Gas Journal, April 19, page 114)*.

The Taipeh wildcat is one of at least four planned during the year. Sites for the tests were selected after studying geological surveys made during 1953-54. A rig has been moved to the site of the second wildcat. It will be drilled on the west flank of the Chutauchi structure near the new field.

C.P.C. plans seismic surveys in at least three areas along the western coastal plain of the island. Shothole drilling began late in October in the southwestern coastal area after seismic instruments purchased by C.P.C. were delivered by Southwesten Industrial Electronics.

Teikoku Oil Co., Tokyo, has contracted to do the seismic work for C.P.C. Local personnel is being trained by the Japanese company to continue the work once the contract expires.

Island's production . . . Formosa's oil production in 1954 was almost double the average annual postwar output and was the highest since 1940 when it hit 38,050 bbl. The 1954 output was 35,-082 bbl. This was almost double the 1953 output of 17,800 bbl.

Production from the new field accounted for most of the increase last year. But the new field turned out smaller than expected. Three offsets were drilled, but two were dry. Two other stepouts are being drilled. One of the dry wells is being deepened for structural information.

PARTY CHIEF for Japanese firm directing the survey examines seismic record.

Drilling on the island totaled 17,800 ft. during 1954, which was more than twice the average annual footage for the postwar years.

New production also was found last year in the island's old oil field, Chuhuangkeng, and in Chinsui (Kinsui) gas field. The new well in the gas field produced about 210 M.c.f. daily in August, but a farther outpost was dry.

In spite of the 61,725 M.c.f. of gas found in new wells in 1954 at Chutauchi and Chinsui fields, total production of 1,025,968 M.c.f. was only 94 per cent of the preceding year's output. This decrease reflects how the old gas fields are nearing depletion.

C.P.C.'s operations are being carried on with assistance from the Foregn Operations Administration and from the United Nations Technical Assistance Administration.

FORMOSA'S FIRST SEISMIC SURVEY took the crew to a cane field in the southern part of the island.

B.P.C. Plans Platformer

A 1,750-bbl. Platformer will be built at the Porto Marghera refinery at Venice. The refinery is jointly owned by British Petroleum Co. and Azienda Generale Petroli.

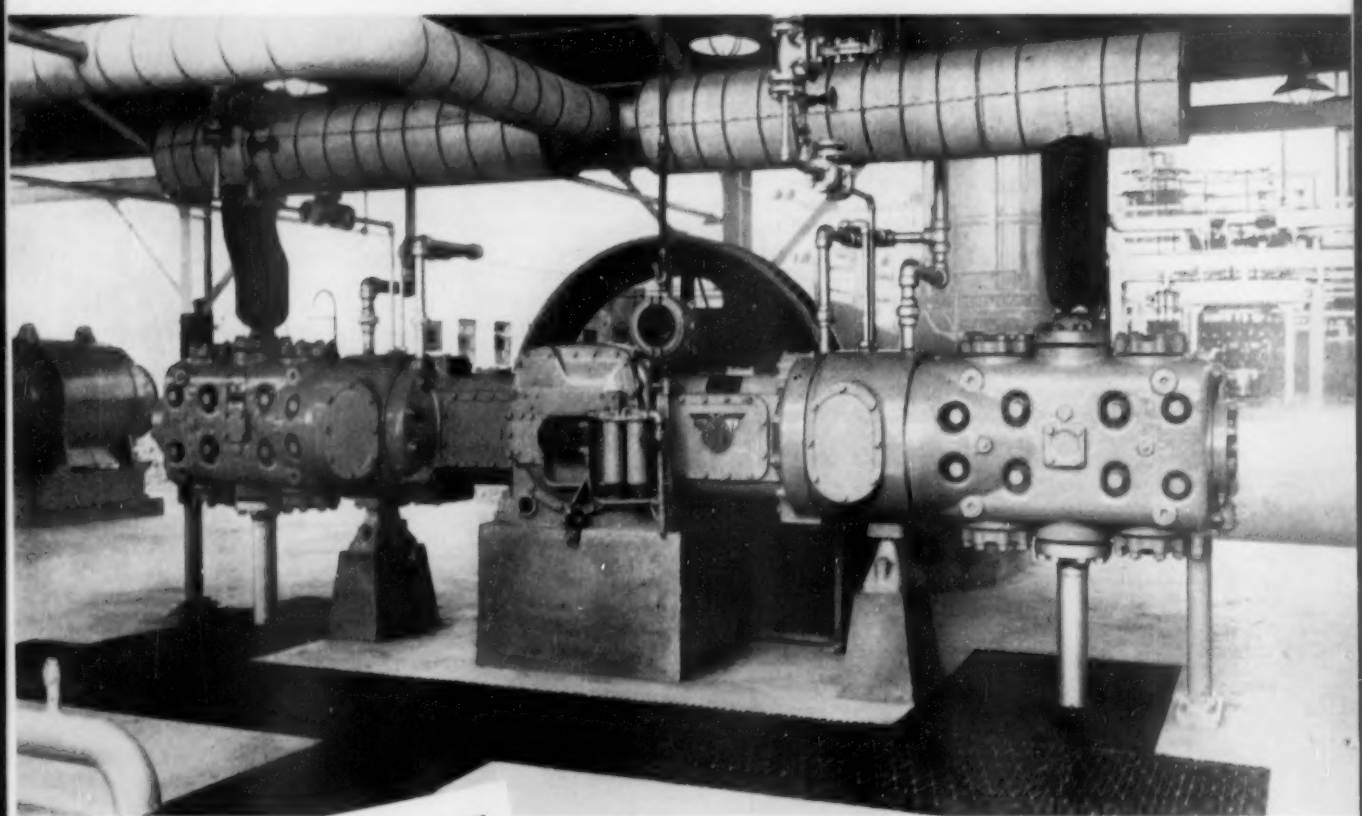
B.P.C. already has six Platformers operating or under construction at other refineries it operate. A 5,000-bbl. Platformer was scheduled to go into operation in February at B.P.'s Kent refinery on the Isle of Grain.

Another Example of Efficient Power at Lower Cost

EM's and GMX's at Sarnia...

NEW HIGH'S IN COMPRESSOR EFFICIENCY

for Higher Octane Gasoline



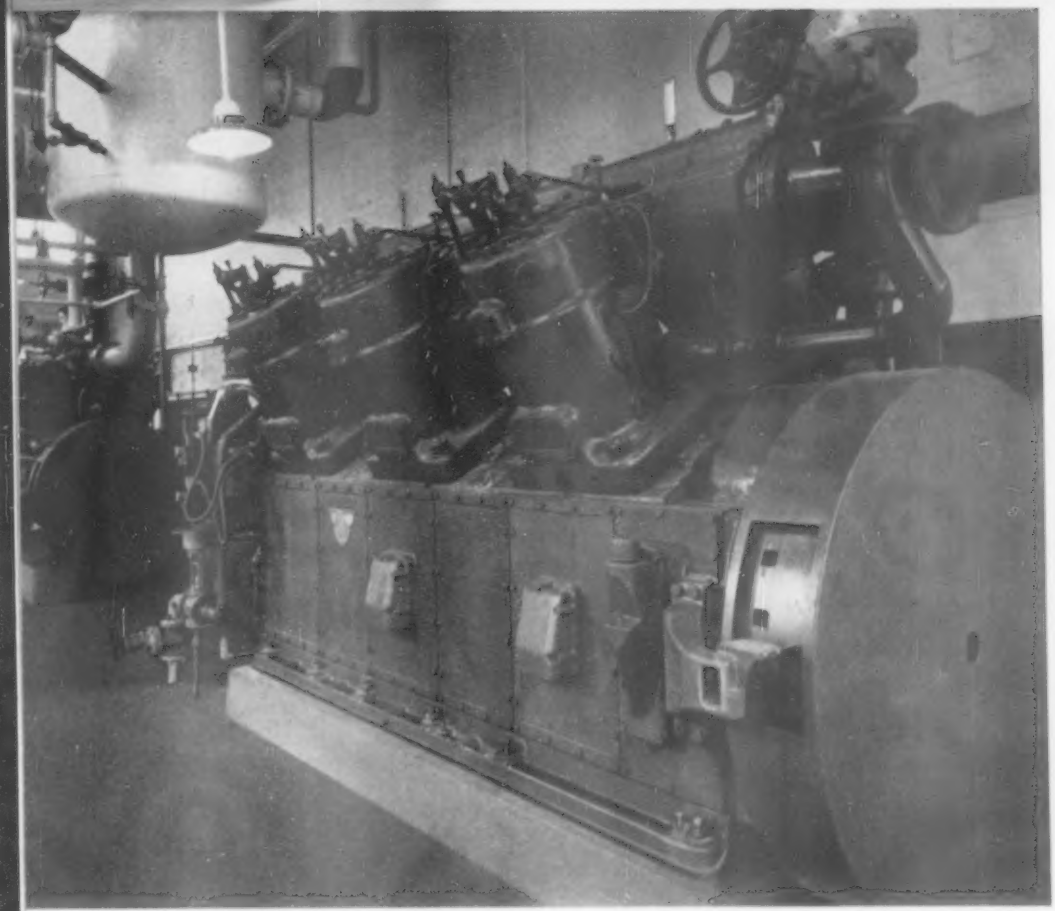
One of the two Cooper-Bessemer EM compressors, rated at 300 hp, serving in Canadian Oil's UOP Platforming operation. Note the simple, neat and compact arrangement of this "open air" unit.

ANGLE

Compressors

New York Washington, D. C. Bradford, Pa.

San Francisco, Cal. Houston, Dallas, Greggton, Pampa and Odessa, Texas Seattle, Wash.



Two 6-cylinder Cooper-Bessemer GMX compressors, rated at 330 hp at 400 rpm, being installed to recirculate gas for the Houdriformer process at Sun Oil Company's new Sarnia, Ontario plant.

Cooper-Bessemer 2-cylinder EM's and 6-cylinder GMX's — offer efficient compressor service for two different oil companies employing different processes at Sarnia, Ontario.

AT the Sarnia refinery of Canadian Oil Refineries, Ltd., two motor-driven EM compressors recycle hydrogen for their new UOP Platforming unit. This unit, charging nearly 3800 barrels per stream day, produces high yields of gasoline with an octane number reaching well into the 90's. Equipped with non-lubricated cylinders, EM's play a vital and dependable role in this production of high octane gasoline.

And, for the new Houdriformer of a similar capacity at Sun Oil Company's Sarnia plant, two Cooper-Bessemer GMX V-angles, also with non-lubricated hydrogen cylinders, are used in the recirculation of gases. This catalytic reforming unit likewise upgrades low octane naphthas to high quality motor fuels.

Whether you are considering UOP Platforming, a Houdriformer, or other operations requiring compressors of virtually any type, — Cooper-Bessemer offers more than a century of reliable compressor building experience. Contact your nearest office for detailed information.

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New Tanker Plan

Saudi Arabia, condemned for granting Onassis preference in crude shipments, now thinks it will buy Greek's tankers

THE Saudi Arabian Government last week came up with a new scheme for getting into the tanker business with Aristotle Onassis, the Greek shipowner.

The plan called for the sale of a large tanker fleet by Onassis to Saudi Arabia. The vessels would then be placed with Onassis for operating control.

This step was advanced as an alternative to the much-attacked agreement which Onassis negotiated a year ago with Saudi Arabia. This provided that Onassis would set up a Saudi-flag fleet of 500,000 tons in return for certain preference rights in the shipment of oil produced in Saudi Arabia.

The agreement has been denounced by maritime nations, including the United States and Britain. It made Onassis a persona no grata in the oil industry and caused Arabian American Oil Co. to invoke the arbitration clause in its concession contract for the first time in the history of the company-government relationship.

Parley scheduled . . . Onassis, at his headquarters in Monte Carlo, was quoted as saying the new plan originated with King Saud of Saudi Arabia. Sources in the oil industry questioned whether such an arrangement meant much of a change from the objectionable features of the original agreement. Generally, the view was that it was another maneuver by Onassis to get himself off the hook in his controversial deal.

The issue to be arbitrated between Aramco and Saudi Arabia is whether the Onassis agreement violated terms of the company's concession.

The Saudi Arabian Government has designated Helmy Badoui, former Egyptian minister of commerce, as its arbitrator. Badoui and the yet-to-be-announced Aramco representative will designate a third member of the panel. If they disagree, the choice will be made by the president of the World Court. The proceedings are to be held March 4-6 in Lucerne, Switzerland. The exact terms of the questions to be arbitrated have not yet been formally drawn up.

It appeared last week that continued efforts are being made to avoid taking the issue to arbitration. The company would like to settle the problem amicably, although the feeling in the industry is that there can be no backing down on the basic principle involved. The proposal for the sale of tankers by Onassis to Saudi Arabia also was believed to show a desire on his part to head off the arbitration.

Reports from Monte Carlo quoted Onassis as saying he might sell as much as 1,000,000 tons of tankers to Saudi Arabia. If the sale goes through, the plan would be to call off the arbitration proceedings.

Record-holder idle . . . Meanwhile, the world's biggest tanker, built to sail under Saudi Arabian flag, is now 8 months old and has yet to carry a cargo.

The Onassis-owned 46,800-ton Al-Malik Saud Al-Awal has been idle at a Hamburg dockside, although manned by a Greek crew of 63 men.

Reports are that the 1,104-ft. ship is among the tankers that would be sold to King Saud. Shippers say the vessel is too big to go through the Suez Canal fully loaded. The tanker was launched last June 5. Fitting out was completed 3 months ago.

Dutch Concession Granted

The Dutch Government has granted Nederlandse Aardolie Mij. an oil concession over an area of 41,000 acres near The Hague.

The concession includes Delft and Rijswijk and a segment jutting out into the North Sea. The company, N.A.M., is owned by Royal Dutch-Shell's Bataafsche Petroleum Mij. and Standard Oil Co. (N. J.). It operates the Netherland's only important oil field, Schoonebeek, which produces about 18,000 bbl. daily.

Delft and Rijswijk are two small areas discovered by N.A.M. in its intensive postwar exploration in the Netherlands. Rijswijk, a 1953 discovery, produces a few hundred barrels daily. Delft was discovered last year and has been producing less than a hundred barrels daily.

Brazil May Liberalize Law

A bill that would liberalize the state-monopoly petroleum policy of Brazil has been introduced by three senators of that country. If passed, the law would permit exploration and development by Brazalian nationals or companies organized under special arrangements.

As the law now stands, all oil operations except marketing are controlled by the state company Petrobras. The proposed law would grant concessionaires the right to explore about 1,480,000 acres (600,000 hectares) and produce petroleum from half of it. The remaining half would form part of the national reserve.

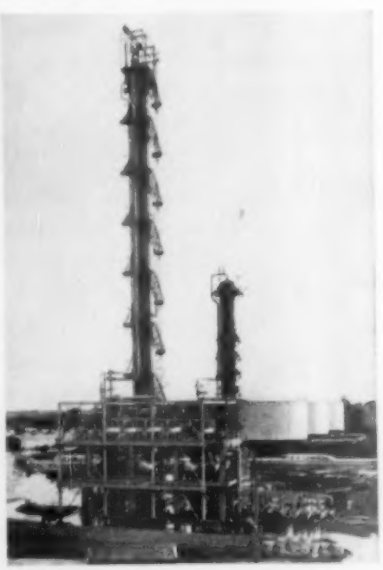
The amendment to the law was presented to Congress by Senators Plinio Rompeu and Othon Mader, of the Democratic National Union Party, and Apolonio Sales, minister of agriculture in the Getulio Vargas government.

There has been criticism within the country by those who had charged the government of President Cafe Filho with sabotaging the national petroleum monopoly. In answer, the government has authorized a $30,000,000 annual expenditure for exploration and development of petroleum.

International Briefs

Underground storage facilities for 10,000,000 cu. ft. of manufactured gas are planned by the British Government's Northern Gas Board. The storage will be in cavities left by excavation in a 120-ft. layer of rock salt at a depth of about 1,000 ft. near Billingham. The project is expected to be ready for use in about 2 years.

Crude oil is the main commodity to be supplied Italy by Communist Al-



Tallest of Its Kind

First plant in the United Kingdom to produce isopentane has been placed on stream at Shell's Stanlow refinery. The plant's output will replace material previously imported for blending in aviation gasoline. Stanlow ranks as one of the most fu ly integrated refineries in Europe. The new isopentane plant includes a 200-ft. high column, believed to be the tallest of its kind in the world.

bania under a recent 1-year trade agreement made by the two countries. The quantity is relatively small, amounting to 25,000 tons or about 165,000 bbl. Albania produces about 3,500 bbl. daily of heavy crude. The agreement is the first between Albania and a western nation.

Standard Oil Co. of California has changed the name of its foreign exploration subsidiary from Richmond Petroleum Co. of California to California Exploration Co. Richmond has been active in Latin America for many years. Socal pointed out the new name more accurately reflects the company's primary function.

Company Expands

French firm gets Italian outlet for crude supplies

CIA. FRANCAISE DES PETROLES has moved into Italy and pinned down a new outlet for its growing supply of crude oil.

C.F.P's new interest in the Italian oil industry is represented by a recently bought 50 per cent share of "Aquila" Soc. per Azioni Tecnico - Industriale. With this step, C.F.P. is expected to become the sole, long-term crude supplier for Aquila's 15,000-bbl. daily refinery at Trieste.

The French company's purchase into Aquila represents another example of the trend toward acquisition of refinery interests as a means of gaining or protecting crude-oil markets. C.F.P., as France's main stake in the international oil industry, holds 23.75 per cent interest in Iraq Petroleum Co., Ltd. With I.P.C.'s output, including Qatar production amounting to more than 700,000 bbl. daily. C.F.P.'s share comes to about 175,000 bbl. daily.

Besides this, C.F.P. has a 6 per cent interest in the new Iranian consortium. Iranian production is to built up to 600,000 bbl. daily by year after next, and this will give the French company another 36,000 bbl. daily.

C.F.P. is 35 per cent owned by the French Government. The pricipal outlets for its crude oil are the two French refineries of its affiliate, Cie. Francaise de Raffinage. These plants have a capacity of about 120,000 bbl. daily.

Under the new arrangement, C.F.P. and the Italian industrial company, Fiat, will each have a half interest in Aquila. C.F.P. earlier took a half interest in Aquila's affiliated marketing company, S.A.P.A.A., which has distribution facilities throughout Italy, including coastal terminals and service stations. The Aquila refinery which supplies this network has 3,500 bbl. daily capacity in thermal cracking as well as a modern lubricating-oil and wax plant built in 1951.

Pricing Revised

Creole schedule has bigger spread for heavier crudes

CREOLE PETROLEUM CORP. has revised its crude-oil price schedule to carry bigger gravity differential for heavier grades.

The company's latest bulletin, effective February 18, leaves old method of changing the price 2 cents for each degree of gravity for crudes of 30 gravity or higher.

For crudes between 20.0 and 29.9, the price changes 2½ cents per half degree or 5 cents per full degree. For crudes of 19.9 or less, the change is 3½ cents per half degree, or 7 cents per full degree.

The same plan for pricing gravity changes was set up when Cia. Shell de Venezuela issued its first posting of Venezuelan crudes *(The Oil and Gas Journal, February 21, page 105)*.

Creole's new bulletin showed different gravities for most of the 16 crudes listed. For these minor gravity changes, prices were adjusted on the old 2-cent scale and thus left unchanged from what a buyer paid for slightly different gravities from those previously shown.

Price changes were made in only three cases: Mara crude, down 16 cents for the same gravity; Pedernales, up 8 cents for the same gravity; and Temblador, down 35 cents for the same gravity. One addition was made to the schedule, La Rosa crude, f.o.b. Amuay in western Venezuela.

The following table shows the source of crude, gravity, and price per barrel:

Cumarebo	48.0-48.9	$3.40
San Joaquin*	41.0-41.9	3.04
Mulata*	36.0-36.9	2.90
Oficina	32.0-32.9	2.82
Jusepin*	32.0-32.9	2.82
Tia Juana light*	31.0-31.9	2.55
Mara*	29.5-29.9	2.40
Tia Juana medium*	26.5-26.9	2.30
Tia Juana 102 L.P.*	25.0-25.4	2.52
La Rosa*	24.5-24.9	2.25
Pedernales*	21.0-21.4	1.71
Temblador*	20.5-20.9	1.95
Tia Juana heavy*	18.5-18.9	2.11
Quiriquire*	16.5-16.9	2.21
Lagunillas heavy	Flat	1.85
Bachaquero*	16.5-16.9	1.80

*Changed or added since last bulletin.

New Oil Discovery on European Mainland

What may turn out to be a highly significant oil discovery has been made by the joint Gulf-Montecatini company, Petrosud, S. A., on the Adriatic coast of Italy. The well produced 2,000 bbl. of 34°-gravity oil daily from 2,550 ft., reportedly from a Tertiary limestone (The Oil and Gas Journal, February 14, page 92). It is the second promising large discovery in Western Europe in over a year. The other was Esso Francaise's Parentis find in southwestern France.

Can Better Fuels Curb Engine Knock?

Multiviscosity lubes have helped by reducing combustion-chamber deposits. Esso engineers now advance the idea that these deposits can be further reduced by use of a fuel in which the higher-boiling materials have been eliminated. Here is their report . . .

by C. L. Fleming, Jr., N. V. Hakala, L. E. Moody, R. W. Scott, and C. O. Tongberg

THE trend toward engines of higher and higher compression ratios will continue. Combustion-chamber deposits are a deterrent to higher compression ratios.

Higher-antiknock-quality fuels are required to satisfy "dirty" engines than would be required by the same engine when "clean." Conversely, a given octane quality fuel will satisfy more clean engines than dirty engines.

Most people agree that combustion-chamber deposits come from both the fuel and the lubricant. In the past 2 years the petroleum industry has made great strides in minimizing the deposits caused by the lubricant. This has been accomplished by the general introduction of multiviscosity lubricants.

It appeared that further reduction in deposit formation could most readily be achieved by **improvement in the fuel.**

The Esso Laboratories present here detailed field data for the effect of fuel volatility on octane requirement increase. The term **"fuel volatility"** is used to refer to the higher-boiling or back-end portion of the fuel.

Two fuels were used: (1) a fuel having an average amount of high-boiling components and which is referred to as the **"average fuel"**; and (2) a fuel in which the higher boiling materials have been eliminated—this is called the **"volatile fuel."**

Here is a rundown on the Esso data:

1. Elimination of high-boiling materials in the fuel reduces octane requirements. The equilibrium octane requirements were 81.2 with volatile fuel and 84.0 with average fuel. These figures are the averages obtained on 1953-54 model cars with compression ratios ranging from 7.5 to 8.25.

2. For the same cars, an equilibrium octane advantage of 5.7 was obtained by using volatile fuel and multiviscosity lube as compared with average volatility fuel and conventional lube.

Authors are with research division of Esso Laboratories, Standard Oil Development Co., Linden, N. J. Paper presented at S.A.E. Golden Anniversary meeting at Detroit, January 10-14, 1955.

3. Cars equipped with future high-compression-ratio engines also showed reduced octane needs when operated on volatile fuels together with multiviscosity lube.

4. Further data show that cars with 9.5 and 10 compression ratios can be operated on 98-99 research octane fuel of proper volatility using a multiviscosity lubricant. If these engines operated on conventional fuels and lubricants they would need fuel of 100 octane or higher.

5. More general use of volatile fuels and multiviscosity lubricants should make possible increased compression ratios without corresponding increase in antiknock quality.

1. Present-Day Cars

The two premium-type gasolines used in the field experiments were (1) one of average back-end volatility with 90 per cent evaporated at 347° F., and (2) a more volatile fuel with 90 per cent evaporated at 302° F. Both fuels contained approximately 50 per cent catalytically cracked stocks and were made from the same refinery streams and by the same processing techniques in the same equipment. They differed only in that about 10 per cent of high-boiling components were omitted from the more volatile fuel. Both blends contained 2.5 cc. TEL per gallon and had nearly the same antiknock quality. Inspections of the fuels are given in Table 1.

TABLE 1—FUEL INSPECTIONS

	Volatile fuel	Average volatility fuel
TEL, cc. per gal.	2.50	2.52
A.S.T.M. distillations (D+L):		
10% evaporated, °F.	122	118
50% evaporated, °F.	190	218
90% evaporated, °F.	302	347
Research Oct. No.	95.8	95.2
Motor Oct. No.	85.5	85.1

The 90 per cent evaporated point of the average volatility fuel agrees quite well with the average 90 per cent point calculated for premium-grade gasolines from the most recent Bureau of Mines motor-gasoline survey (347° F. vs. 341° F.).

Each of the fuels was evaluated in eight 1953-1954 model cars, two each of four makes. The cars used had overhead-valve engines. All had automatic transmissions. The cars are described briefly in Table 2.

TABLE 2—FLEET USED IN EVALUATIONS

Overhead-Valve-Engines—1953-1954 Models

Make	Engine type	Compression ratio
A	V-8	8.25
B	V-8	7.5
C	V-8	8.0
D	In-line 6	7.5

Tests . . . These cars were operated in a caravan over a course consisting of 50 per cent city and 50 per cent suburban-type driving. The top speed was limited to 45 m.p.h. The octane requirements were obtained at approximately 800-mile intervals using primary reference fuels and the Uniontown procedure. The total length of the test was 6,400 miles and the majority of the cars came to deposit equilibrium by 2,400 miles as measured by octane requirement. The data in this report are presented in terms of **equilibrium octane requirement.**

Equilibrium octane requirement is more reproducible than octane requirement increase.[1] Furthermore, the equilibrium octane requirements are a direct measure of the fuel antiknock quality required to prevent knock. The equilibrium octane requirements of two

"Advantage for eliminating heavy ends . . . was equal to 2.8 octane numbers."

cars of the same make on a given fuel and lubricant combination agreed quite well with each other. On the average, the octane requirement of the individual cars were within ±1.1 octane number of the average equilibrium octane requirement for the two cars. A detailed description of the experimental technique has been published previously.[1]

The crankcase lubricant was a multiviscosity S.A.E. 10W-30 lubricant. This was used for two reasons. First, a more conventional lubricant might obscure the fuel differences. Second, the use of multiviscosity lubricants represents the most advanced current position from the standpoint of a practical lubricant with respect to minimizing combustion chamber deposit formation.

The multiviscosity oil was an S.A.E. 10W-30 lubricant made from a closely cut solvent extracted Mid-Continent base stock. It also contained a viscosity-index improver, pour depressant, and a full complement of detergent-inhibitor additives. The sulfated ash content was 0.77 weight per cent. No bright stock was present in the blend. Inspections of this product are given in Appendix Table 1.

Effect of Fuel Volatility

As noted, the majority of the cars came to equilibrium at about 2,400 miles. The equilibrium requirements were obtained by averaging the 2,400-6,400-mile data. All of the car makes show an advantage for the volatile fuel. This advantage varied from two to four octane numbers. In fact, the equilibrium octane requirements of seven out of the eight cars on the volatile fuel, were lower than the equilibrium requirements of the corresponding individual cars on the average volatility fuel. The eighth car on the volatile fuel was slightly higher in requirement than the lower car of the same make on the average volatility fuel, but not as high as the higher requirement car of the same make. On the average, the advantage for eliminating the heavy ends in the average volatility fuel was equal to 2.8 octane numbers. Statistical analysis of the data indicate that this value is real at more than the 99.5 per cent confidence level. Table 3 summarizes the data.

TABLE 3
Effect of Fuel Volatility on Equilibrium Octane Requirement

Two-Car Averages—Controlled Field Tests—Multiviscosity Lubricant

	Equilibrium octane requirement*		Octane advantage for the volatile fuel
Car make	Volatile	Average volatility	
A	87	89	2
B	76	80	4
C	88.5	91	2.5
D	73.5	76	2.5
Avg. (8 cars)	81.2	84	2.8

*Average 2,400-6,400 miles—primary reference fuels.

Eliminate higher boiling material . . . These data demonstrate that the octane requirement increase contribution of the fuel can be substantially reduced by elimination of the higher boiling, thermally unstable hydrocarbons. This fuel development is at least equal in importance to the development of the multiviscosity lubricant. For the first time, a practical method of reducing the fuel contribution to combustion chamber deposits has been found. It is recognized that the magnitude of improvement obtained by the elimination of the higher boiling fractions is probably influenced by the hydrocarbon type of the materials eliminated. This point is being studied further.

Volatile Fuel and Multiviscosity Lube

The effect of using a conventional lubricant with the average volatility fuel was also studied. This evaluation was carried out simultaneously with the studies on the effect of fuel volatility in which the multiviscosity oil was used. The conventional lubricant was representative of a high-quality service-station premium oil. Like the multiviscosity oil, it also was made from solvent-extracted Mid-Continent stocks but contained bright stock. This oil also contained detergent-inhibitor additives, pour depressant but no viscosity-index improver. The sulfated ash content of the conventional oil was 0.45 weight per cent. Two S.A.E. grades were used, an S.A.E. 20W-20 and S.A.E. 30. The S.A.E. 20W-20 was used in three of the four makes of cars. The manufacturers of these recommend the S.A.E. 20 grade. The manufacturer of the fourth car make recommends an S.A.E. 30 grade oil, and this was used in these cars. Inspections of the lubricants are given in Appendix Table 1.

The volatility fuel and multiviscosity lubricant gave much lower equilibrium octane requirements than the average volatility fuel-conventional lubricant combination. Based on the average of eight cars on each combination, there was a 5.7 octane number advantage for the volatile fuel and multiviscosity lubricant. Based on individual makes of cars, the advantage varied from 4.0 to 8.5 octane numbers. The data illustrating this are given in Table 4.

These data show that considerably lower requirements can be obtained by using volatile fuels in combination with multiviscosity lubricants as compared to the requirements reached by more "conventional" products.

It is particularly interesting to look at the high-requirement cars (makes A and C) included in this fleet. The average requirement of these cars operated on the average volatility fuel and conventional oil was 92.5 in terms of primary reference fuels. At this level, these cars would knock on many premium gasolines now available. In contrast, the average requirement of the cars operated on the volatile fuel-multiviscosity lubricant was 88. These cars would not knock on most premium-grade gasolines. Data illustrating this point are presented in Table 5.

The octane requirement advantage for the improved combination of products might be used in either of two ways. First, the customer can advance his spark to obtain maximum performance from the fuel available. Second, as volatile fuels and multiviscosity lubricants are more generally used, it should be possible for the engine builder to go to higher compression ratios without requiring higher octane fuels. As shown in Table 5, the use of the volatile fuel and multiviscosity lubricant

TABLE 4
Comparison of Volatile Fuel and Multiviscosity Lubricant and Average Volatility Fuel and Conventional Lubricant

Two-Car Averages—Controlled Field Tests

	Equilibrium octane requirement*		
Car make	Volatile fuel and multivis-cosity lube	Average volatility fuel and conven-tional lube	Octane advantage
A	87	92.5	5.5
B	76	80	4.0
C	88.5	93	4.5
D	73.5	82	8.5
Avg. (8 cars)	81.2	86.9	5.7

*Average 2,400-6,400 miles—primary reference fuels.

TABLE 5—EFFECT OF FUEL AND LUBRICANT IN HIGH REQUIREMENT CARS

Four-Car Averages—Cars A and C

	Equilibrium octane requirement*	Estimated equivalent research Oct. No.
Volatile fuel plus multiviscosity lubricant	88	90
Average volatility fuel plus conventional lubricant	92.5	94
Advantage	4.5	4

*Primary reference fuels.

"As volatile fuels and multiviscosity lubricants are more generally used . . . engine builders can go to higher compression without requiring higher octane fuels."

made 4 research octane numbers available. These 4 octane numbers could be used by the engine builder to increase the compression ratio. The permissible increase is estimated at about one compression ratio unit.

Multiviscosity and Conventional Lube

Data were reported previously[1] which showed the multiviscosity lubricants had a 4-octane-number advantage over the more conventional lubricants. The fuel used in these earlier experiments was similar to the volatile fuel in this paper. From the present series of field experiments, it is also possible to compare the performance of the multiviscosity lubricant with that of the conventional lubricant in engines run on an average volatility fuel. Even with this fuel, the use of the multiviscosity lubricant reduced the average equilibrium octane requirement about 3 octane numbers. This is illustrated in Table 6.

The nearly 3-octane-number advantage for the multiviscosity lubricant is in good agreement with the earlier data.

Comparison With Other Data

It has been shown in a previous publication[1] that the data from controlled field tests used in this study agree quite well with data obtained in typical owner-driven cars. The data from the current series of field experiments also show that the octane requirements obtained in the controlled field test are realistic. For example, there is good agreement between the octane requirements of the cars operated on the average volatility fuel and conventional lubricant and the data for similar cars given in the 1953 octane requirement survey by the Coordinating Research Council.[2] This survey can be considered to represent the requirements obtained with average fuels and lubricants. Table 7 illustrates that on the average the difference between the controlled field test and the C.R.C. survey is about 2 octane numbers.

Data for Car B are not included as this make was not surveyed by the C.R.C. in 1953.

Surface Ignition

Surface ignition (preignition) was not a problem with the cars in the controlled field experiment and none of the cars were surface ignition limited. This is based on the absence of surface ignition during mileage accumulation and the fact that none of the cars were surface ignition limited by the Uniontown procedure.

To accentuate surface ignition, at the end of the experiment (6,400 miles) half of the cars were rated under the severe conditions described by Williams and Landis.[3] This consists of rating the cars on a hill using the brakes. Successively lower-octane-number fuels are used until the car will afterrun with the ignition off. Table 8 summarizes the data. The lowest fuel on which the cars will **not** afterrun is taken as the surface-ignition requirement. As can be seen, in no case did the cars afterrun on a fuel which satisfied the level road detonation requirement.

TABLE 8—SURFACE-IGNITION REQUIREMENTS

Primary Reference Fuels—Hill Climb—Full Throttle—Brakes

	Detonation*	Surface ignition requirement†
Volatile fuel—multiviscosity lubricant	81.2	77
Average volatility fuel:		
Multiviscosity lubricant	84.0	80
Conventional lubricant	86.9	81

*Equilibrium requirement—level road—Uniontown. †Lowest fuel on which the cars did not afterrun.

It was necessary to go so far below the octane requirement of the car to get afterrunning that the heavy knock probably induced the surface ignition observed. The observation that surface ignition is not an acute field problem is in good agreement with previous surveys.[4]

The studies in current cars show that there is a considerable advantage for volatile fuels and multiviscosity lubricants. Similar studies have now been made in cars having future-type high-compression ratio engines as discussed in the next section.

TABLE 6—EFFECT OF LUBRICANT ON OCTANE REQUIREMENT

Controlled Field Test—Average Volatility Fuel

Lubricant—	Equilibrium octane requirement*
Conventional	86.9
Multiviscosity	84.0
Advantage	2.9

*Primary reference fuels.

TABLE 7—COMPARISON WITH C.R.C. DATA[1]

Average Fuel Lubricant: Primary Reference Fuels

	Average octane requirement	
Car make	Controlled field test	C.R.C. 1953 survey
A	92.5	93
C	*93	95
D	*82	85

*1954 model; same compression ratio as 1953.

2. High-Compression-Ratio Engines

Many automotive engineers feel that combustion-chamber deposits are particularly detrimental at high-compression ratios (9:1 and greater). Higher compression ratios, on the other hand, would permit improvements in car performance or economy, or both.[4,5,6] Therefore, the solution to the combustion-chamber deposit problem in future-type high-compression engines would represent a real contribution toward the development of more efficient internal-combustion engines. Data from the Esso Laboratories studies demonstrate that just as in present-day cars, the use of volatile fuels and multiviscosity lubricants is beneficial in these future-type engines.

To investigate the importance of octane requirement increase and the occurrence of surface ignition in future-type high-compression-ratio engines, four 1953-1954 model engines were converted to nominal 9.5:1 and 10:1 C.R. by the best methods available to the authors, based on discussions with the particular engine manufacturers. The standard designed compression ratios of these engines ranged from 7.5:1 and 8.25:1 C.R. The engines were converted through the use of special cylinder heads, milled production cylinder heads, or high-crown pistons. The cars are listed briefly and described in Table 9.

The high-compression-ratio engines were installed in the automobiles for which they were originally designed. All the cars had automatic transmissions. The spark timing on the engines was the same as that used on the pro-

TABLE 9—EXPERIMENTAL V-8 HIGH-COMPRESSION-RATIO ENGINES

	Compression ratio—	
Make	Standard	High
A	8.25:1	10:1
B	7.5:1	9.5:1
C	8.0:1	9.5:1
E	8.0:1	10:1

"Surface ignition noted only when octane number was four units below standard."

duction conventional compression-ratio engines. As a standard maintenance feature, the crankcase oil was changed at 2,000-mile intervals.

Tests . . . These cars were driven on a cycle similar to that described previously in this paper, that is, in city-suburban traffic at a maximum speed of 45 m.p.h. over a prescribed course. Octane requirements for both knock and surface ignition were determined at approximately 1,000-mile intervals. The method of requirement determination was the Uniontown procedure. The cars were rated with the transmission downshift disconnected. Both primary reference fuels and a series of commercial-type reference fuels (Appendix Table 2) were used to determine the cars' requirements. There was no difference in detonation or knock requirements with the primary and commercial fuels. Surface ignition, however, was more severe with the commercials. For this reason, the ratings are given in terms of the commercial fuels. Also, the commercial fuels are more representative of the fuels which will be used in future-type engines.

Volatile Fuel and Multiviscosity Lube

The four cars were operated on a leaded experimental premium-quality fuel of high volatility. The same high-quality multiviscosity crankcase oil (S.A.E. 10W-30) as discussed before was also used (Appendix Table 1). Inspections of the gasoline used are given in Table 10.

TABLE 10—FUEL INSPECTIONS

Research octane number	98
Motor octane number	87
TEL content, cc. per gal.	2.6
A.S.T.M. distillation (D+L):	
10% evaporated, °F.	131
50% evaporated, °F.	202
90% evaporated, °F.	297

After over 5,000 miles of city-suburban driving on this fuel-lubricant combination, the antiknock quality requirements of three of the four cars (B, C, and E) remained essentially unchanged over that experienced with the clean engines at the start of the test. The octane number of the fuel required to suppress knock determined these three engines' no-noise requirement. Surface ignition was observed only when the research octane number of the commercial reference fuel tested was about four units below the no-knock requirement of the three cars. All three of these cars operated without noise (knock or surface ignition) on the tank fuel. The fourth car (Car A) increased in knock requirement about 2.5 units in 5,000 miles and became surface-ignition noise limited after about 2,600 miles. The data obtained on the volatile fuel and multiviscosity oil in the four high-compression cars are given in Table 11.

In three out of the four cars evaluated, completely satisfactory performance was obtained with the volatile fuel and multiviscosity lubricant. This demonstrates that successful operation of many 9.5 and 10:1 compression ratio engines is possible by the proper choice of the fuel and lubricant.

In the fourth car (A), the performance was not satisfactory. It is not known whether the unusual performance in Car A is due to the particular engine or whether it would be representative of many engines of this type. The combustion chamber design of engine A is somewhat different from that of any other engines included in this study. It is too early to tell whether the unsatisfactory performance in Car A can better be overcome by changes in combustion chamber design or by even better fuels and lubricants than those discussed in this paper. The effect of fuel and lubricant in this particular car is being investigated further.

Average Volatility Fuel

In an attempt to investigate the performance characteristics of more conventionally formulated fuels, a test was carried out using an experimental high-octane-number gasoline of more nearly average commercial volatility. The average volatility and volatile high-octane fuels differed only in that about 15 per cent of the heavy components present in the average volatility high-octane fuel were omitted to make the volatile fuel. Inspections of the average volatility fuel compared to the volatile fuel are given in Table 12.

TABLE 12—FUEL INSPECTIONS

	Avg. volatility fuel	Volatile fuel
Research octane number	97	98
TEL content, cc. per gal.	2.7	2.6
A.S.T.M. distillation (D+L):		
10% evaporated, °F.	136	131
50% evaporated, °F.	225	202
90% evaporated, °F.	352	297

The average volatility fuel was evaluated in Cars B and E immediately following the experiment described above on the volatile fuel and multiviscosity lubricant. The combustion chambers were not cleaned between the two tests, and no change was made in the lubricant used. The use of the less volatile gasoline during 1,000 to 2,000 miles of driving caused serious surface ignition in Car E, and resulted in an octane requirement increase of about four units in Car B. The data on this phase of the test are shown in Table 13.

These data demonstrate that the elimination of high-boiling thermally unstable materials results in lower requirements in high-compression-ratio engines in much the same way as current cars.

It was interesting to note that returning the two cars to the original premium-quality fuel, again without deposit removal, eliminated the critical surface ignition noise in Car E but had no beneficial effect on Car B's knock requirement even after 2,400 miles of driving.

Conventional Lubricant

To determine the effect of using a more conventional lubricant than the multiviscosity lubricant, the crankcase oil in Car C was changed to a product which is more typical of conventional present-day motor oils. This oil was an S.A.E.-30, 105-viscosity-index prod-

TABLE 11—OCTANE REQUIREMENTS OF HIGH-COMPRESSION-RATIO CARS

	Octane requirements (Res. O.N. of Com. Ref. Fuels)					
	Initial		2,000-3,000		5,400-5,700	
Car	Knock	S.I.	Knock	S.I.	Knock	S.I.
B	95.0	None	96.5	<94.5	96.5	None
C	99.0	None	99.0	None	99.5	<96
E	98.5	None	99.0	<96	98.5	None
A	97.0	None	97.0	>99.5	99.5	>99.5

Note: "None" signifies that no surface ignition was observed.

TABLE 13—EFFECT OF FUEL VOLATILITY ON O.R.I. AND SURFACE IGNITION

Car	Fuel	Mileage on fuel	Octane requirement, research octane number: Knock	Surface ignition
E	Volatile	5,700	98.5	None observed
	Average volatility	2,700	99.5	>99.5
B	Volatile	5,400	96.5	None observed
	Average volatil	1,100	100.5	None observed

"Multivis lube, without bright stock, has advantage over more conventional lubes."

uct and had a sulfated ash content of 0.68 weight per cent. It also contained bright stock. The combustion-chamber deposits were not disturbed between tests, and no change was made in the fuel. When the more conventional oil was used in Car C, the knock requirement increased 4.5 units after only 1,600 miles of driving. Surface ignition noise was also observed, but only on a fuel which did not satisfy the knock requirement of the car. Upon replacing the conventional-type oil with the multiviscosity lubricant in the crankcase, the car's knock requirement decreased nearly to its original value. The effect of crankcase lubricant quality on octane requirement is presented in Table 14 and shown graphically in Fig. 1.

These data are in good agreement with those obtained at lower compression ratios which indicate that the use of a multiviscosity lubricant, without bright stock, has a considerable advantage over more conventional lubricants.

Acknowledgment

The results discussed in this paper represent the efforts of a number of other workers at the Esso Laboratories in addition to the authors. The authors take this opportunity to express their appreciation and recognition of these contributions.

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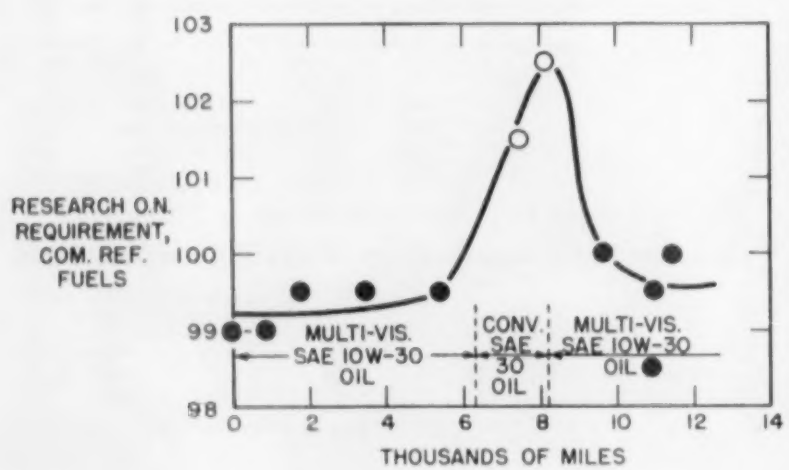
10. Hall, C. A., Warren, J. A., and McCullough, J. D., "Practical Yardsticks for Deposit Effect," S.A.E. preprint, Atlantic City, N. J., June 6-7, 1954.

TABLE 14—EFFECT OF LUBRICANT ON OCTANE REQUIREMENT
(Car C—Volatile Fuel)

	Mileage on fuel	Octane requirement, research octane number	
		Knock	Surface ignition
Multiviscosity S.A.E. 10W-30	5,800	99.5	None observed
Conventional HD S.A.E. 30	1,600	102.5	(100)*
Multiviscosity S.A.E. 10W-30	2,600	99.5	None observed

*Estimated, but known to be less than the knock requirement.



APPENDIX

TABLE 1—LUBRICANT INSPECTIONS

	Multi-viscosity lubricant	Conventional lubricant	
S.A.E. grade	10W-30	20W-20	30
Type	MS-DG	MS-DG	MS-DG
Gravity, °A.P.I.	31.4	28.8	27.7
Viscosity at 100° F., S.U.s.	348	312	472
Viscosity at 210° F., S.U.s.	67.5	54.2	62.6
Viscosity index	141	104	100
Flash point, °F.	435	435	470
Sulfated ash, wt. %	0.77	0.45	0.45
Bright stock	No	Yes	Yes

TABLE 2—COMMERCIAL REFERENCE FUELS

Fuel designation	Octane number		TEL (ml./gal.)
	Research	Motor	
1	88.5	81.0	1.16
2	91.0	82.7	1.76
3	92.5	83.0	1.97
4	94.7	84.0	2.34
5	96.2	85.0	2.84
6	97.5	85.5	2.96
7	99.5	87.5	2.92

BOOKS

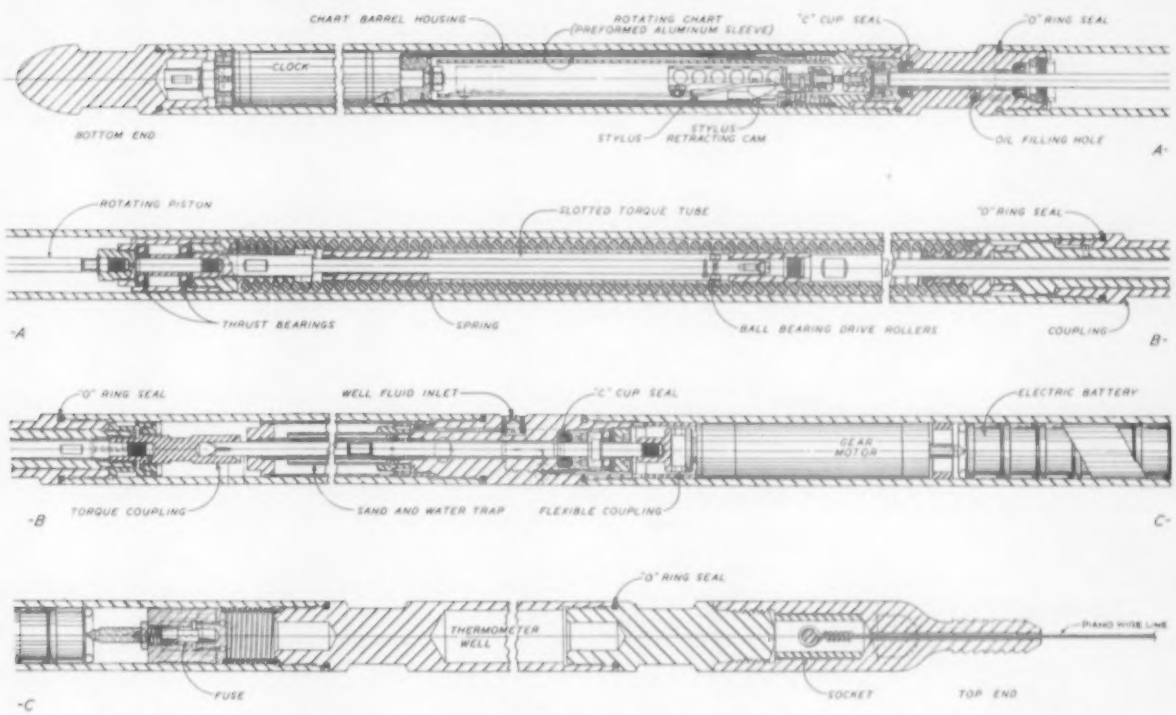
ROCKY MOUNTAIN ASSOCIATION OF GEOLOGISTS GUIDEBOOK — 1954 FIELD CONFERENCE—SECOND TRIP—DENVER AND CANON CITY AND RETURN. Available from the association, 601 Continental Oil Bldg., Denver. 30 pp.

This guide book contains a resume of the four papers presented during the conference as well as a detailed road log of the route covered. The abstracts are as follows: (1) "Paleozoic History of Southeastern Colorado," by John C. Maher, U. S. Geological Survey, Tulsa. This deals with the depositional history of southeastern Colorado and the possibilities of oil and gas production; (2) "The Greenwood Field, Baca County, Colorado, and Morton County, Kansas," by R. D. Widney, Cities Service Oil Co., Bartlesville, Okla. Greenwood is a stratigraphic trap with present proven limits of field covering approximately 250 to 300 sq. miles. The paper deals with general geology, unusual water tables in the field, and the reserves; (3) "Occurrence of Oil and Gas in Fractured Field Reservoirs at Florence and Other Localities in the Rocky Mountain Area," by George R. Downs, consulting geologist, Denver. This covers the occurrence of oil and gas in fractured shale in the Rocky Mountains. It summarized the common features of these reservoirs; (4) Uranium Occurrences in South Central Colorado," by Robert T. Russell, Atomic Energy Commission, Denver. This covers the sedimentary conditions and structure controlling uranium deposits.

SOME FUNDAMENTALS OF PETROLEUM GEOLOGY. By Dr. G. D. Hobson. Published by Oxford University Press, Amen House, London, E.C. 4, England. 139 pp., 18 shillings (United Kingdom only).

This book deals with the nature of oil accumulation along with ideas on the origin of oil and its aggregation into an oil pool. Reservoir pressure is also discussed in some detail as well as compaction of sediments. If possible the book uses both a quantitative and a qualitative treatment. Students and those engaged in oil finding and development will find this book interesting.

Rotating Piston Gives Precision to New



THIS NEW RECORDER, developed by Standard Oil Co. of California, is 1¼ in. o.d. and almost 11 ft. long. Fig. 1.

WELL DEPTH-PRESSURE RECORDER

Instrument is designed for usable pressure range of 140 to 4,720 psi.

by W. R. Postlewaite*, A. C. West†, and H. J. Cavigli‡

A PRECISION type of well-depth-pressure-recording gage has been developed by Standard Oil Co. of California which provides a degree of accuracy not attainable with other portable subsurface instruments. The new recorder is a completely self-contained gage lowered into the well on a wire line in the usual way.

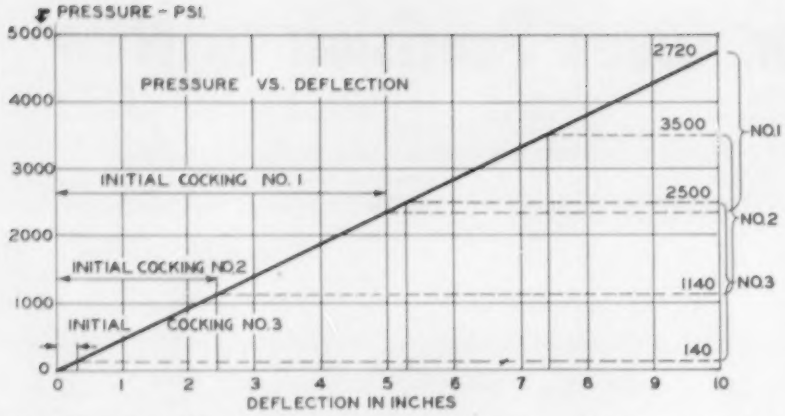
The friction-free principle of a rotating piston as used in the dead-weight tester, is incorporated in the new subsurface pressure recorder, which employs a spring-balanced pressure piston rotated by a battery-powered gear motor. The ¼-in.-diameter piston is subjected to the pressure of the well fluid on the upper end connected to the load spring. The lower end, which moves axially in a sealed recording chamber, carries the stylus which scribes on a chart driven by a clock motor. Although the well-oiled C-cup seals develop substantial friction forces, these are all tangential to the piston and do not influence in any way the accuracy of the gage's performance.

The instrument, designed for a usable pressure range of 140 to 4,720 psi., employs one load spring which has three different cockings, and the offset for one psi. can be detected on the chart by the unaided eye. Outside diameter is 1¼ in. and the length is 10 ft., 10⅝ in. This length calls for a somewhat longer pipe lubricator at the well head than is needed with the usual subsurface pressure recorders, but this new instrument is intended for special service where a high degree of accuracy is required, and where the careful calibrating technique and the time required for the proper field use of the instrument are warranted.

Extensive laboratory measurements have been made over a period of about 12 months, and the calibration has been checked in an 8,000-ft.-deep static water well near Coalinga, Calif. In this water-well test, the average departure of the pressure readings from the mean at a given pressure amounted to only 0.053 per cent, and the instrument was sensitive to a pressure change of less than 0.012 per cent. Additional experience in the proper use of the new instrument and its related calibrating and chart-reading apparatus is expected to show even better results.

The new well depth-pressure gage developed by Standard of California embodies five sections of the outer casing. (Note that the breaks in Fig. 1, necessary to show such a long instrument, do not correspond to the actual

Authors are with: *engineering department, Standard Oil Co. of California; †California Research Corp.; and ‡production department, Standard Oil Co. of California.



TO GIVE FULL COVERAGE, the single spring has three pressure ranges: No. 1 is 2,360 to 4,720 psi.; No. 2 is 1,140 to 3,500 psi.; and No. 3 is 140 to 2,500 psi. Fig. 2.

instrument-body sections.) The lower-end section houses the spring-wound clock, and its integral record-chart barrel, and the bottom piston seal, which keeps this lower air-filled chamber dry and oil free. The next section above contains the sealed rotating piston, the long load - extension spring, and the slotted torque tube which turns the piston through miniature ball-bearing-drive rollers. All of this second section is completely immersed in lubricating oil. The next section above houses the sand and water trap to protect the gage. It also contains the well fluid inlet.

Just above this in the fourth section is the C-cup sealed rotary drive shaft. It is carried on a ball-thrust bearing, and flexibly coupled to the small, cylindrically shaped, electric gear motor which serves to rotate the pressure-responsive piston in the bottom of the instrument where dual C-cup seals are employed. The top motor terminal engages the 12-cell electric storage battery which can supply enough power to drive the piston for six or more hours. The electric circuit is completed at the top through a fuse that is grounded through a coil spring which holds the battery and motor in proper axial contact.

The uppermost section of the instrument is comprised of a sealed thermometer well to house three maximum-reading thermometers, and the top end piece which encloses the usual socket connection for the 0.072-in. diameter piano-wire line used to suspend the instrument in the well.

The nine threaded and piloted joints in the housing connections are all sealed against well pressure by means of O-rings which can be made up even by hand to be absolutely pressure tight. The three chambers enclosing the clock, the motor and its battery, and the thermometers are all dry and contain air. But the long spring housing and the sand-trap section are both completely filled with lubricating oil which transmits the well pressure to the top end of the rotating piston. The lube-oil charge is pumped in through the filling hole indicated at the bottom of the main spring chamber, and this oil completely displaces the air clear up to the well-fluid inlet just below the gear motor.

Seal friction . . . Since for each pressure point the instrument requires about 30 minutes to reach a state of equilibrium involving a combination of both thermal and stress effects, a complete pressure traverse in a well could involve as much as 5 to 6 or more hours. With the very limited space in the instrument, it soon became evident that if the gage was to operate successfully on storage-battery power, the torque and energy requirements for the piston drive would have to be carefully defined along with the frictional characteristics of the rubber C-cups. This C-cup seal is of the pressure-actuated type which hugs the piston as the pressure increases, it is suited to pressures of 5,000 psi. or more and temperatures to 300° F.

Preliminary laboratory torque measurements of the piston-seal friction were made at speeds up to 47 r.p.m. with oil pressures to 7,500 psi. at 300° F. Test results, together with careful dynamometer measurements of the drag torque of the several ball-thrust bearings, provided a basis for sizing the gear motor and the battery to run it. With about 30 minutes at each pressure level, the piston could have been rotated considerably slower than the 10 to 15 r.p.m. finally used and still provide sufficiently rapid response. However, additional gearing would entail a lower mechanical - drive efficiency, which would tend to offset the power saved at the lower piston speed.

Motor drive . . . A special, miniature, d.c. gear motor was developed for service in this instrument by R. H. Long in his private laboratory. This little motor, in itself a unique development, has a diameter of 1 in., a length of 14⅞ in., a gear ratio of 729 to 1, and produces a torque of 5 in. per lb. with an output speed of 10 r.p.m. at 300° F. Laboratory torque measurements for the instrument's piston seals and ball-thrust bearings at 5,000-psi. hydrostatic pressure indicated values up to 3 in. per lb., and for 7,500 psi. a torque of 4 in. per lb. Subsequently, this frictional resistance was reduced in the actual instrument by chrome plating and highly polishing the piston. The torque normally amounts to only 1.4 in. per lb. at 4,000 psi. and 180° F. Reserve power is necessary, however, to handle unusual conditions which the tests showed could arise occasionally and which would stall a weaker motor.

The following typical dynamometer test data were obtained with the motor at 15 volts, and an ambient temperature of 200° F.

Torque, in.-lb.—	0	1	2	3	4	5
Current, ma.	130	170	180	215	230	260
Shaft speed, r.p.m.	15.8	15.0	14.3	13.6	12.5	11.5

The motor proper idles at about 11,300 r.p.m., and has an over-all mechanical efficiency of 29.8 per cent at a torque of 3 in. per lb. This is a very sturdy unit, totally enclosed, with all the shafts carried on ball bearings throughout. The locked armature current is 700 ma. at 15 volts and the motor is fused at 300 ma.

Battery . . . Tests on a number of different kinds of dry-cell batteries at elevated temperature indicated that the Mallory RM-3 cell is preeminently well suited to this special application where sustained output is required at temperatures of 250° to 300° F. In fact, increased temperature here results in an even more favorable voltage-service life discharge curve than at normal surface-ambient temperatures. Twelve RM-3 cells connected in a series stack give the required 15 to 16 volts, and the nylon-wrapped battery is very compact with its 1 in. o.d., and a length of but 7⅛-in. Shock resistance of this all-metal jacketed cell is an important advantage in subsurface exploration work of this kind. Recent improvements have increased the capacity of the individual RM-3 cell to 2,000 ma.-hours. One of the outstanding features of this cell is its unusually long shelf life.

Clock and chart . . . The spring-wound mechanical motor or clock used to rotate the record-chart holder makes one

revolution per hour. The thin outer body shell extends upward about 7 in. to completely shroud and protect the chart barrel proper so the clock-chart tube assembly can be manually handled outside of the instrument without risk of damage to the precise alignment of the chart holder.

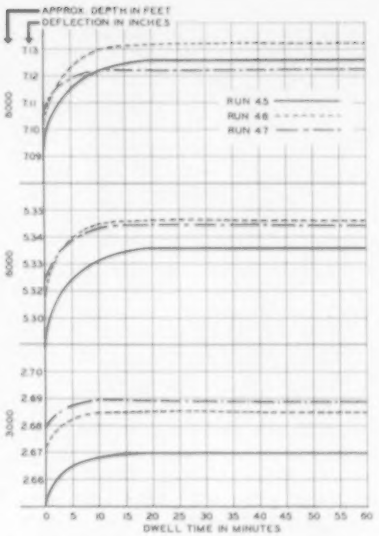
The chart proper is a polished sheet of aluminum 2.437 in. wide by 6¾ in. long by 0.003 to 0.004 in. thick. It is milled to size for dimensional accuracy and preformed into an open cylindrical shape which can be pushed snugly into the 0.782-in. i.d. tubular chart holder. The longitudinal edges of the chart abut one another firmly, and a special expanding-rubber gripper tool is required to insert the chart and properly seat it in the tube holder. This hand tool is also later used to extract the chart after a pressure run.

Since no movement of the chart in the barrel can be tolerated during the recording period, it is securely clamped in place at the upper end by an alloy-steel split sleeve or ring. This is carefully sprung into place by means of another hand tool or jig which is operated by a thumb screw. This clamp sleeve positively anchors the chart at the top, and the lower end is left free to expand downward.

The net length of the scribed pressure record is 5 in., which corresponds to the total axial movement of the piston-actuated stylus. The bright surface finish of the aluminum chart takes a fine line when scribed by the sharp Stellite-tipped stylus to give good legibility. The width of the scribed line measures 0.0003 to 0.0004 in., and with proper side lighting the crosshair of the 60-power magnifying microscope used on the chart reader can be adjusted to read to the top edge of this record line.

A sapphire stylus was first tried in the recorder but was found inferior to Stellite.

To improve the smoothness of the record line, the stylus arm has been warped over at a 13° angle to give the laterally inclined point a trailing effect.



A DWELL TIME of about 30 minutes is needed for the instrument to come to equilibrium. Fig. 3.

For the same reason, the stylus arm proper was made very rigid and the leaf spring at the hinged upper end was made short and stiff properly to resist the minute torsion due to stylus reaction, and so help produce a uniform record line.

Stylus . . . As shown in Fig. 1, the stylus arm carries a small cam lobe on one side which coacts with a spring-loaded flanged sleeve mounted slidably in the upper end of the clock chamber. This ring automatically retracts the delicate stylus when the clock-and-chart assembly is withdrawn from contact with the ring. The reverse action then releases the stylus against the chart when the chart barrel is inserted in the instrument so as to cock the retracting spring. The stylus assembly proper is mounted on a small, rectangular, bronze carrier block which reciprocates inside of a long, slotted guide tube. This tube projects clear down into the chart barrel to accurately hold the stylus in position. This prevents rotation of the stylus with the pressure piston.

A small spring-loaded swivel joint connects the stylus carrier block and the main pressure piston as shown. This flexible pin joint allows for lateral "runout" of the ¼-in. piston which is on the order of 0.0015 in. when the piston is extended the full 5-in. stroke. In this way, it minimizes the friction forces that otherwise would result.

Load spring . . . The load spring used in this instrument is made of chrome silicon mill-tempered wire which is accurately cold formed to shape and stress relieved. It is then subjected to an oven aging treatment at 380° F., with the spring deflected 10 per cent beyond its maximum elongation in service. Six hundred hours of this static oven aging completely eliminates the initial tension of the close-wound coils and stabilizes the spring's performance. The threaded end connectors of the load spring are precision ground and expand the spring slightly on assembly.

Calibration . . . The decrease in torsional modulus or stiffness of the spring with increases in ambient temperature, along with various other dimensional and internal-pressure changes due to both thermal and pressure effects, requires that the instrument be calibrated in a closed bomb where both the pressure and temperature ranges encountered in the well can be duplicated. The laboratory equipment to do this involves a pressure case enclosed in a circulating hot-oil bath.

The importance of accurate temperature control is evident when it is observed how significant even small thermal changes are on the instrument's behavior. For example, the temperature effect at 2,300 psi. is equivalent to 0.42 psi. per degree Fahrenheit, and at 4,300 psi. it is 0.79 per degree Fahrenheit. This is about 0.086 psi. per degree Fahrenheit per inch of spring deflection.

The test bomb is provided with a small 110-volt gear motor to rotate the

THE NEW INSTRUMENT is readable and responsive to pressure changes of less than ¼ psi. These records are from lab tests at 73° F. Above, the pressure was dropped about 20 psi. between the steps. At the right, the readings are continuous with no drops between the steps. Fig. 4.

instrument's piston through a sealed drive shaft during the calibration period. In this way the batteries and miniature gear motor required when running in the well need not be used in these prolonged test runs.

The primary pressure standard used in this laboratory work has sensitivity of 0.05 psi. and an inaccuracy limit of 0.01 per cent when used within the lower 1 in. of travel of the piston. This 0.01 per cent value is equivalent to an over-all inaccuracy of 0.05 psi. at 5,000 psi., and the cylinder and piston diameters are made to a tolerance of ten-millionths of an inch to achieve this performance. The 25-lb. weights are machined to within 100 mg. of true mass. Suitable corrections are made for gravitational acceleration at the location of the laboratory, and also for buoyancy of the surrounding air.

In work of this sort, the chart readings should be made with greater accuracy than the instrument is capable of giving so as to minimize reading error. This objective was not fully attained here, but the chart-reading instrument used was fitted with a special microscope which permitted reading to 0.0001 in. The lead screw of the chart reader, used to traverse the 5-in. chart, was carefully calibrated by means of gage blocks. This calibration corrected pertinent pitch variations and irregularities although the chart reader's lead screw had been carefully cut on a precision lathe in a prominent instrument company's shop.

For best results, corrections for temperature effects must be made in reading the record charts. For example, since the well depth-pressure gage is in the air, when the chart-holder assembly is placed inside and the base line scribed, changes in atmospheric temperature will alter the location of the base line. Tests covering a usable range of 38° to 120° F. showed a base line displacement of 0.002 in. equivalent to about 1 psi. on the chart. Another temperature effect is found in reading the completed chart at different atmospheric temperatures. This is due to the different coefficients of linear expansion of the aluminum chart and the chart reader.

Performance

Further work on, and calibration of, the new well depth-pressure gage is continuing, but the test data already at hand provide considerable information as to the order of its performance and its unusual sensitivity of response to small changes in pressure.

Water well test . . . Following extensive laboratory tests, the rotating-piston gage was taken to Coalinga and run in a static water well 8,000 ft. deep where the bottom-hole pressure was 3,421 psi. and the temperature 222° F. These tests showed the need for a dwell time of 30 minutes for the instrument to come to a state of stress and thermal equilibrium, as indicated in Fig. 3.

In a series of 10 repeat runs, the average departure of pressure readings from the mean value at a given pressure amounted to only 0.053 per cent, and the instrument was found to be readily sensitive to a 1-ft. change in depth at 8,000 ft., or a change of 0.012 per cent. In terms of pressure at 3,000 ft., for example, a diversion of 0.53 per cent in 1,294 psi. amounts to about 0.69 psi.

These water-well tests demonstrated that the battery could power the motor for well over 6 hours in the well, and the maximum-reading thermometers confirmed known well-temperature data, and checked on repeated runs to within 0.10 per cent.

A run made in the water well with the Amerada recorder currently used in this field gave departures ranging from 0.23 up to 0.56 per cent from the accurately established well data. The well depth-pressure relationship in this well was based on data from the International Critical Tables and included corrections for temperature and salinity.

After the rotating-piston instrument had reached equilibrium at a given depth, incremental increases in depth of 1 and 2 ft. were made. The results of these tests at the 6,000-ft. depth were as follows:

	—Press. change (psi.)— Measured	Calculated
1-ft. increment (3-minute dwell time)	0.36	0.425
2-ft. increment (3-minute dwell time)	0.67	0.85

The reproducibility of the instrument under conditions to be contended within a well may be evaluated by considering Table 1 which presents data taken with 30-minute dwell times at 2,400 psi. and 220° F. These four readings were obtained on separate record charts in the static water well test at Coalinga.

TABLE 1—SPRING DEFLECTION
(Inches)

	4.9994
	4.9999
	4.9991
	4.9985
Mean	4.9993

Maximum variation from the mean is 0.0008 in. corresponding to an error of 0.383 psi. or 0.016 per cent.

Although the load spring of this instrument is entirely immersed in oil, the tests have clearly demonstrated the need to hold the temperature and pressure constant for about 30 minutes following a shift in either pressure or temperature. A similar result was observed by E. R. Brownscombe and D. R. Conlon with the Amerada gage in their November 1945 A.I.M.E. paper, "Precision in Bottom-Hole Pressure Measurement." This dwell time carries additional meaning with the rotating-piston gage since the battery capacity had to be sized accordingly.

In precision work of this sort in the field, corrections for both temperature and stress elongation of the 0.072 in. diameter Halliburton piano-wire line used to suspend the instrument in the hole, would be pertinent in properly determining the depth level.

Since the practicability of the gage relies on the permanence and reliability of the several rubber C-cups on the piston, and the nine O-ring seals used on the outer case, considerable attention was given to the design and materials of these rubber parts.

BOOKS

MANUFACTURE AND APPLICATION OF LUBRICATING GREASES. By C. J. Boner. Published by Reinhold Publishing Corp., 430 Park Avenue, New York 22, New York, 977 pp., $18.50.

This comprehensive work contains complete and detailed information on all phases of manufacture and application of lubricating greases. Structure and theory of lubricating greases are described, and full chapters are devoted to all raw materials, processes, and manufacturing equipment. One chapter each is devoted to aluminum-base, barium-base, calcium-base, lithium-base, sodium-base, lead-soap, strontium-base, miscellaneous metal-soap, mixed-base, and complex-soap lubricating greases.

Lubricants containing specific thickeners and nonsoap jelling agents receive detailed attention. Special emphasis is placed on the effects of each ingredient or treatment upon the characteristics of the final product, and upon the methods of evaluating these characteristics by either chemical or physical means.

Application of greases and trends in greases are also discussed.

AUTOMATIC CONTROL BIBLIOGRAPHY. By Warren F. Wade, graduate student, Massachusetts Institute of Technology, and Emory N. Kemler, professor of mechanical engineering, University of Minnesota. Published by Summary Reports, P. O. Box 176, Spring Park, Minn. 331 pp., $15.

This bibliography tries to summarize the American and English literature relating to the automatic control field, primarily for the period since 1900. In using most bibliographies, it is often difficult to tell the general coverage of an article from its title. Brief abstracts are included on most of the articles in this bibliography to meet this need at least partially. The abstracts do not try to evaluate the importance of the articles, but rather to give a general idea about the type of material.

The bibliography is arranged alphabetically by authors and alphabetically by magazines for those articles for which an author was not shown. Lists of articles by applications and areas of interest are included at the end of the bibliography. A list of books related to the field of automatic controls and servomechanisms is given. And a list of magazines giving particular emphasis to automatic controls is included.

The brine pit at Sun Oil Co.'s Sarnia refinery underground L.P.G. storage project is equipped with a flare located next to the outlet of the brine line as it enters the brine pit.

Case History . . .

How Sun Created Underground Storage

Salt beds used to store L.P.G. at Sarnia refinery

by Patrick F. Dougherty

AT its 15,000-bbl. per day Sarnia, Ontario, refinery, Sun Oil Co., Ltd., is now operating the first underground caverns to be used for process storage of L.P.G. products. Three salt caverns have been completed and two more are now being washed in the Salina formation which underlies the new Canadian refinery.

Total capacity of this underground storage now stands at 150,000 bbl. and it is estimated that the ultimate capacity may extend to 500,000 bbl. This report deals specifically with (1) selection of the salt bed, (2) spacing pattern, (3) drilling and casing program, (4) washing program, (5) leakage testing of tubing, (6) cavern strapping, and (7) brine-pit operation.

Coring . . . Extensive coring was performed on the first well from 1,425 to 2,663 ft. The corings indicated existence of two salt beds which could be used. One bed extended from 2,068 to 2,377 ft. and the other from 2,524 to 2,651 ft. The percentage of insoluble material was determined on both of the beds.

Selection of Salt Bed

Two of the existing underground storage caverns at Sarnia were washed in the upper bed, and one was washed in the lower bed.

The decision to wash two of the caverns in the upper bed was based on the following:

1. The anticipated lower drilling, completion, and operating costs.

2. Additional protection was provided against intercommunication between the cavern washed in the lower bed and the adjoining one in the upper bed by the 150 ft. of shale, dolomite, and limestone between the two beds.

3. The desire of management to have the caverns ready for operation as soon as possible.

Stringers . . . Since the upper bed is more than twice as thick as the lower bed, it was expected that caverns of the desired capacity could be washed more rapidly in the upper bed than in the lower. It was realized that the two stringers, at 2,113 to 2,122 ft. (containing 75 per cent insolubles) and at 2,135 to 2,140 ft. (containing 70 per cent insolubles), represented a hazard because of the possibility of their sudden collapse and consequent breaking or bending of the washing tube. However, the apparent uniformity of distribution of the insolubles in the above-mentioned stringers, judged by the appearance of the cores, indicated the possibility of a gradual solution of the stringers rather than their sudden collapse.

Actual washing experience indicated the abrupt collapse of the stringer at 2,135 to 2,140 ft. A portion or all of this stringer fell to the bottom of the cavern. The stringer at 2,113 to 2,122 ft. apparently collapsed and formed a bridge. As a result of the bridging, the removal of the washing tube was extremely difficult, and it was necessary to drill through the bridged stringer before the tubing could be reinserted. Because of this, the initial cost and time required to complete the caverns in the upper bed were greater than in the lower bed. Furthermore, there was uncertainty as to further collapse of the stringers mentioned which would put the caverns out of operation and entail additional workover cost.

Lower bed . . . The cavern in the lower bed, at 2,544 to 2,651 ft., was completed without trouble. Therefore, the last two caverns washed at Sarnia are in the lower bed. This discussion will be mostly confined to the caverns in the lower salt bed, and particularly to the last two caverns washed.

Another important factor which must be considered in selecting the salt bed is the possibility of enlarging the cavern after it has been placed in operation by using fresh water instead of

Author is process engineer, manufacturing department, Sun Oil Co., Philadelphia.

brine for displacing the hydrocarbons. If such is the plan, the salt bed selected should be free of large stringers due to the possibility of stringer collapse and consequent twisting or breakage of the tubing while withdrawing hydrocarbons.

Spacing Pattern

The spacing pattern of the wells at Sarnia was based on reducing the chance of intercommunication between the finished caverns as a result of washing or accidental overpressuring, and on economy in the interconnecting piping between the caverns.

With this in mind, the spacing pattern for the caverns was based on the following assumptions:

1. The ultimate capacity of each cavern would be 200,000 bbl.

2. The effective thickness of the salt bed which was washed would be 100 ft. (The over-all thickness of the lower salt bed is approximately 127 ft.)

3. The diameter calculated from (1) and (2), which is approximately 120 ft., was doubled to allow for lack of uniformity in the washing operation.

Inasmuch as a minimum space of 350 ft. between the caverns was desired, the bore holes through which the caverns were to be washed were drilled 600 ft. apart.

Drilling and Casing Program

A 17½-in. hole was drilled to a depth of approximately 200 ft. and 12¾-in. casing was set at this depth using sufficient cement to fill the annulus from the base of the 12¾-in. casing to the surface. An 11-in. hole was drilled with fresh-water mud to a depth of 1,425 ft. At this point salt-saturated mud was used and coring started with a 6⅛-in. diamond core barrel. This coring was continued completely through the Salina formation. (The 6⅛-in. core hole was then reamed to 11 in. to total depth after which 8⅝-in. casing was set in the water-insoluble formation immediately over the salt body in which the cavern was to be washed.)

The annulus between the 8⅝-in. casing and 11-in. hole was filled with cement from the base of the 8⅝-in. casing to the surface.

After drilling out the 8⅝-in. casing plug, a hydrostatic pressure was placed on the casing seat and the open hole below, to a maximum pressure of 0.8 psi. per foot of depth to the bottom of the hole.

The enlargement of the 6⅛-in. hole to 11 in. was then continued to the desired total depth. A 7-in. floating string was run to the depth required to afford, by means of a kerosine seal, protection to the roof of the cavern during the washing operation. At this point, 4½-in. Hydril tubing was run to within approximately 3 ft. of the bottom of the drill hole.

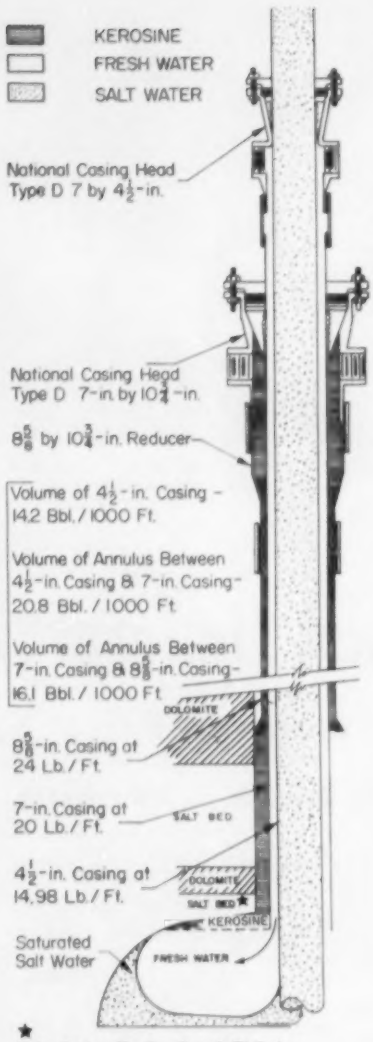

KEROSINE
FRESH WATER
SALT WATER
National Casing Head Type D 7 by 4½-in.
National Casing Head Type D 7-in. by 10¾-in.
8⅝ by 10¾-in. Reducer
Volume of 4½-in. Casing - 14.2 Bbl./1000 Ft.
Volume of Annulus Between 4½-in. Casing & 7-in. Casing - 20.8 Bbl./1000 Ft.
Volume of Annulus Between 7-in. Casing & 8⅝-in. Casing - 16.1 Bbl./1000 Ft.
DOLOMITE
8⅝-in. Casing at 24 Lb./Ft.
7-in. Casing at 20 Lb./Ft.
SALT BED
4½-in. Casing at 14.98 Lb./Ft.
DOLOMITE
SALT BED ★
KEROSINE
Saturated Salt Water
FRESH WATER
★ 7-in. Casing To Be Set 4-Ft Below Dolomite Stringer So That Kerosine Can Be Kept in Contact With Salt Directly Below Dolomite.

Fig. 1 — Temporary hookup for washing L.P.G. storage well.

Washing Program

The factors which normally must be considered in determining the optimum rate at which a cavern should be washed are:

1. Availability and cost of fresh water.
2. Problem of brine disposal.
3. Thickness of the salt bed being washed.
4. Nature of the insoluble material in the salt bed.
5. Time limitations.

At Sarnia there were no problems created by the supply or cost of the fresh water, brine disposal, or the nature of the insoluble materials in the salt beds. For this reason, our prime consideration was the time element, inasmuch as the caverns were required for refinery operating reasons at a specified date.

The first 5,000 bbl. of cavity was made by injecting fresh water through tubing, and the resulting brine withdrawn through the annulus between the 4½-in. tubing and the 7-in. floating string. This was done, despite the fact it was an inefficient method of washing, because it was believed desirable to create enough space to hold the insolubles which would settle out in later washing when the fresh water was injected through the annulus and the brine withdrawn through the tubing.

Note that sufficient kerosine was injected to fill the annulus between the 7-in. floating string and the 8⅝-in. casing to give some measure of protection to the roof during this preliminary washing. After the above described washing, the cavern was pressure tested to 600 psig. after which the flow was reversed. Fresh water was injected into the annulus between the 4½-in. tubing and the 7-in. floating string, and the resulting brine withdrawn through the 4½-in. tubing. (Fig. 1).

Calculating capacity . . . Throughout the washing, the volumes of fresh water injected and brine withdrawn were measured with displacement meters. The specific gravity of the brine was determined at hourly intervals. From these data and the use of the appended curves and tables, the capacity of the cavern was calculated as washing progressed. An example of such a calculation follows:

AN EXAMPLE OF AN UNDERGROUND STORAGE PROBLEM

GIVEN:

Fresh water injected—62,320 bbl. Temp., 77° F.

Effluent brine—60,400 bbl. Saturated. Temp. 77° F. Sp. gr. = 1.1978.

TO FIND:

Capacity of cavern.

Solution

BASIS:

Saturated brine at 77° F. contains 146.5 bbl. NaCl/1,000 bbl. brine (from Fig. 2).

NaCl weighs 757.7 lb./bbl.—From I.C.T.

Water weighs 349.9 lb./bbl.—From I.C.T.

Shrinkage due to solution of NaCl in water (Fig. 2).

CALCULATION:

Effluent brine of 60,400 bbl. contains 8,849 bbl. NaCl (from Fig. 2).

Effluent brine of 60,400 bbl. contains (60,400 — 8,849)/0.9704 = 53,190 bbl. fresh water. (Fig. 2 shows shrinkage factor of 0.9704.)

The 8,849 bbl. of NaCl in effluent brine represents a similar volume of water in the cavern brine. In addition more NaCl is dissolved by the water to reach saturation. Therefore, the volume of saturated brine in the cavern is equal to 8,849 + Y where Y is NaCl. The volume percentage of salt

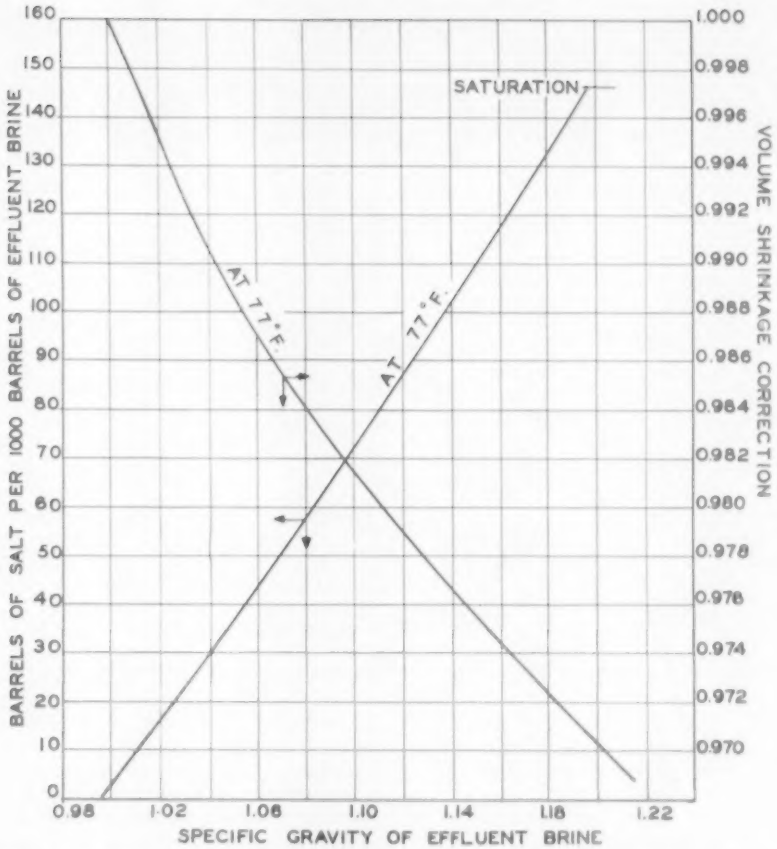


Fig. 2—This chart gives: (a) salt content of effluent brine from well during washing period and (b) shrinkage due to solution of NaCl in water—versus specific gravity of effluent brine. Reference: I.C.T. 3:79.

in a saturated NaCl solution is 14.65 per cent.

$$\frac{Y}{8{,}849 + Y} \times 100 = 14.65$$

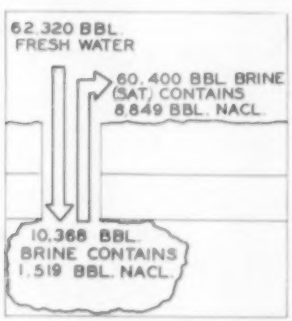
Y = 1,519 bbl. NaCl in cavern brine solution.

Cavern size = 8,849 + 1,519 = 10,368 bbl.

Summary:

70,768 bbl.—Total brine (sat. at 77° F.).
60,400 bbl.—Brine effluent.
10,368 bbl.—Brine left in cavern.
60,400 bbl.—Fresh water part of brine (shrinkage).
62,320 bbl.—Fresh water injected.
10,368 bbl.—Cavern capacity.

Graphic Presentation of Problem



Test for tightness . . . At intervals of approximately 10,000-bbl. increase in cavern capacity, the cavern was tested for tightness. This normally involved consideration of a gradual decline in pressure when the brine in the cavern was not saturated. When the desired cavern capacity was washed, the cavern was allowed to stand until the brine, which it contained, was saturated before making the final test for tightness.

The cavern capacity, as calculated from washing data in the example just given, can be checked by a compressibility test using data on isothermal compressibility of NaCl solutions given by Gibson and Loeffler, Ann. N. Y. Acad. Sci. 51, 727-752 (1949).

It should be noted that throughout the washing, additional kerosine was injected to protect the roof of the cavern. The reasons for concern regarding the washing out of the cavern roof are:

1. The portion of the cavern which is washed above the 8⅝-in. casing seat (the roof) acts as a trap for the liquefied gas and makes it nonrecoverable by brine displacement.

2. Should leakage in the 4½-in. tubing make it necessary to withdraw the tubing for repairs, considerable time would be required to bail or swab the brine through the tubing so that the brine level would be below the 8⅝-in. casing seat. This would be necessary in order to vaporize the trapped liquefied gas and thus make possible the safe withdrawal of the tubing.

On completion of the washing, pressure testing, and check determination of capacity, as described above, the kerosine used as a seal was withdrawn by brine displacement through the annulus between the 7-in. floating string and the 8⅝-in. casing. The kerosine thus withdrawn was measured. The extent of recovery of the kerosine originally injected is an indication of the effectiveness of the kerosine seal in preventing the washing out of the roof above the 8⅝-in. casing seat.

At this point the temporary christmas tree used in washing, the 7-in. floating string, and the 4½-in. tubing were removed. The permanent christmas tree and the 4½-in. tubing were installed. The 4½-in. tubing was set approximately 2 ft. from the bottom of the cavern. Fresh water was injected through the annulus between the 8⅝-in. casing and the 4½-in. tubing and brine withdrawn through the 4½-in. tubing in order to make sure that no obstructive material had lodged in the 4½-in. tubing. The well and the new christmas tree were pressure tested to 600 psig.

Testing the Tubing for Leaks

Past experience indicated the need for establishing the tightness of the tubing before the cavern was placed in use, for the following reasons:

1. Leakage of the tubing can result in liquefied gas entering the tubing with the result that during the period of liquefied gas injection into the cavern and consequent brine displacement, large volumes of liquefied gas can be released to the atmosphere.

2. There is also a question as to the possibility of the leak being the result of a small fracture which could eventually result in complete breakage of the tubing during a period of liquefied gas injection. This, under certain conditions, could produce an extremely hazardous condition. As a matter of safety, such leakage would in all probability make it advisable to empty the cavern and repair the tubing. This could result in the cavern being out of service for a long period, particularly if liquefied gas were trapped in the cavern roof.

In order to remove the tubing safely, the brine level in the cavern should be lowered (by pumping, bailing, or swabbing through the tubing) to a point below the casing seat, and the trapped liquefied gas allowed to vaporize to the atmosphere through the annulus. This appears necessary due to the possibility

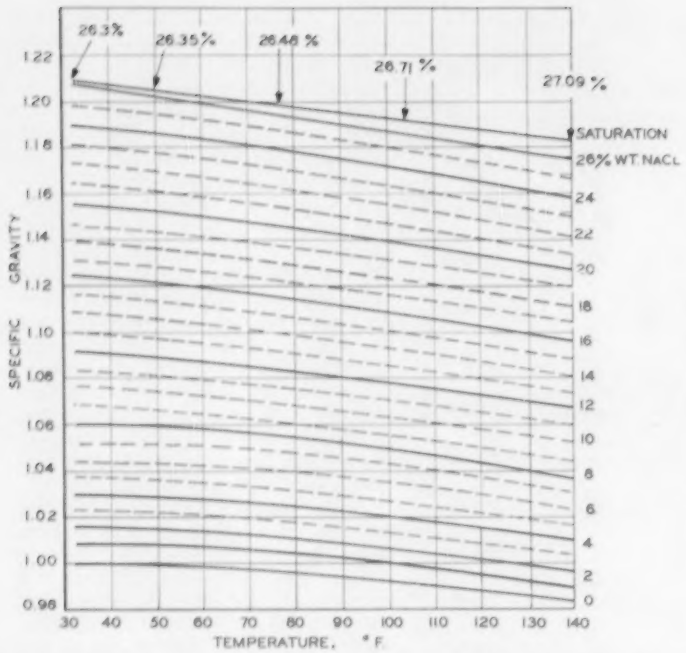


Fig. 3—Specific gravity versus temperature for aqueous NaCl solutions. Reference: I.C.T. 3:77,105.

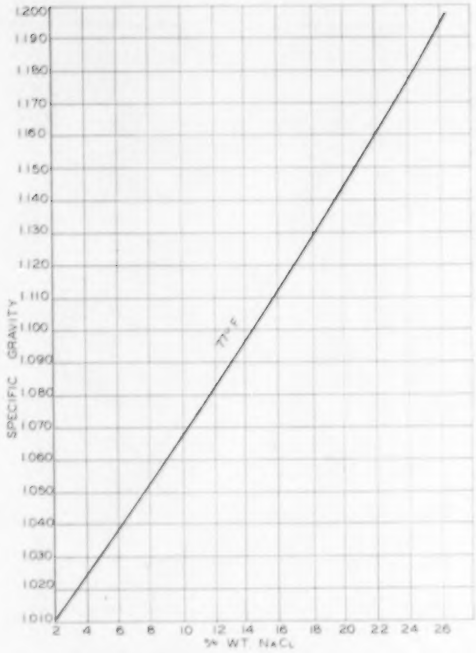


Fig. 4—Specific gravity vs. weight per cent for NaCl solutions.

of a stringer or roof collapse occurring during the time the tubing is being withdrawn. Such a collapse produces a pressure surge. This pressure surge might result in a portion of the trapped liquefied gas reaching the surface through the annulus. The sudden release of liquefied gas to the atmosphere would be hazardous inasmuch as the workover rig would be in operation.

For these reasons the method for testing the tubing hereafter described was employed before the cavern was placed in operation. Patent application has been filed on this method.

Propane into tubing . . . A measured column of liquid propane is introduced into the tubing and the volume of brine thus displaced in the annulus between the tubing and casing is measured and tested for propane. A volume of propane equal to the capacity of 50 ft. of the tubing is injected at one time. The injected propane is allowed to stand for a sufficient period of time (an average of approximately 10 minutes) for it to reach the surface through the annulus if a leak exists in the tubing. The displaced brine, after passing through a meter, enters a small separator where the gas liberated, if any, is tested for combustibles. This operation is repeated until the full length of the tubing has been tested, and a definite return of propane from the bottom of the tubing has been established. After the test has been completed, a portion of the propane used in the test is injected into the annulus between the tubing and the casing through a small equalizing line. The remainder is released to the brine pit and burned.

In view of the method employed in washing the cavern and the relative absence of large stringers, it can be assumed that the shape of the cavern approximates a cylinder. Thus, a given volume-height relationship will fix the approximate diameter. This volume-height relationship can be obtained by measuring the differences in shut-in annulus pressures (liquefied gas) at the surface after successive additions of known volumes of liquefied gas to the cavern. The rise in pressure thus obtained together with the calculated base pressure required on the annulus to balance the brine column from the bottom of the casing seat permits calculation of an equivalent diameter at the various test points.

The maximum diameter of the cavern calculated in this manner is useful since it provides a check on the validity of the assumed well-spacing pattern.

Brine Pit

To reduce the hazard resulting from a release of liquefied gas or of normally liquid hydrocarbons through the brine line to the brine pit, a flare is kept in operation at all times next to the outlet of the brine line as it enters the brine pit. A sudden release of hydrocarbons can result from a break in the tubing during the time hydrocarbons are being injected into the cavern or from accidental overfilling of the cavern. The purpose of the flare is to ignite any hydrocarbons thus vented. Immediate ignition of the hydrocarbons is considered desirable because it prevents their movement to a point of ignition in a built-up or otherwise critical area; furthermore, a fire in the brine pit immediately brings the situation to the attention of the operator. The value of this flare has been established by operating experience.

The brine pit is equipped with an overflow and the overflowing brine enters the St. Clair River; hence, it was considered necessary to locate the inlet of the overflow line near the bottom of the brine pit in order to prevent possible entrance of burning or unignited hydrocarbons into the river.

Appendix

Example for calculation of shrinkage (Fig. 2):

Given:
Fresh water = 100 bbl.
Bbl. of NaCl dissolved at 77° F. = 7 bbl.
NaCl weighs 757.7 lb./bbl.
Water weighs 349.9 lb./bbl.

Find:
Volume of solution.

Solution:
Volume of solution assuming no shrinkage = 107 bbl.
Weight per cent NaCl in solution

$$= \frac{7 \times 757.7}{(100 \times 349.9) + (7 \times 757.7)} \times 100$$

$$= 13.2 \text{ per cent}$$

From Fig. 3, specific gravity of solution = 1.092.
From Fig. 2, shrinkage = 0.983.
Solution volume = 107 × 0.983 = 105.2 bbl.

Fundamentals of Gas Lift—10 (Final)

Gas-Lift-Valve Spread . . . How to Find It

by C. V. Kirkpatrick

IN a well, a gas-lift valve does not open at the same pressure at which it closes. The difference between the well-head pressure at which the valve opens and that at which it closes is called the "spread" of the valve.

Spread is important because it affects two other important things: injection gas-oil ratio and spacing of the valves.

When a straight bellows-charged valve is open, it is held open by the casing pressure acting over all the effective area of the bellows, **including** the area of the valve port. The pressure in the bellows is acting over that same area at the same time to close the valve. When the two pressures are equal, the valve closes.

Once the valve is closed, the pressure tending to open it acts over the effective area of the bellows **less** the area of the valve port, if we assume no help from the tubing. Therefore, we need higher pressure to open the valve than to keep it open. Spread, then, is simply a measure of the difference in the effective area of the bellows and the area of the valve port.

Spread, G.O.R., spacing . . . How the spread of the gas-lift valve affects injection gas-oil ratio depends upon the annulus volume. Consider an intermitting well on which the time-cycle controller has just stopped flow of gas into the annulus. The operating valve in the well won't shut just because the controller has shut. The valve will stay open until the pressure in the annulus has bled down its closing pressure. If the annulus is large, a large volume of gas will pass through the gas-lift valve after the controller has shut. If the annulus is smaller, a smaller volume of gas will pass through the valve after the controller shuts.

Many wells inject more gas per cycle than is passed through the valve by reason of spread. But, if the volume of gas injected per cycle is small, the spread should be considered when choosing the valves. A low spread may mean the difference between a low and a high injection gas-oil ratio.

In regard to spacing, the valves should be placed so that valve has a lower closing pressure than the one above. This closing pressure depends on the temperature gradient in the particular area and on the opening pressure of the valve at 60° F. In areas where the temperature gradient is low, a string of valves may all be set at the same opening pressure for 60° F. If the temperature gradient is high, the string must be progressively dropped in opening pressure down the hole.

Author is chairman, department of petroleum engineering, University of Houston.

How much spread? . . . To find out how much spread we have in a valve, assume that the valve in Fig. 1 is about to open. Then the force keeping the valve closed, F_c, is equal the force trying to open the valve, F_o. From Fig. 1, we see:

$$F_c = P_B A_B + S_T (A_B - A_V)$$

$$F_o = P_V (A_B - A_V) + P_T (A_V)$$

where:

P_B = pressure **inside** the valve bellows.

P_V = pressure in casing **opposite the valve** just before opening.

P_T = pressure in the tubing **opposite the valve** just before opening.

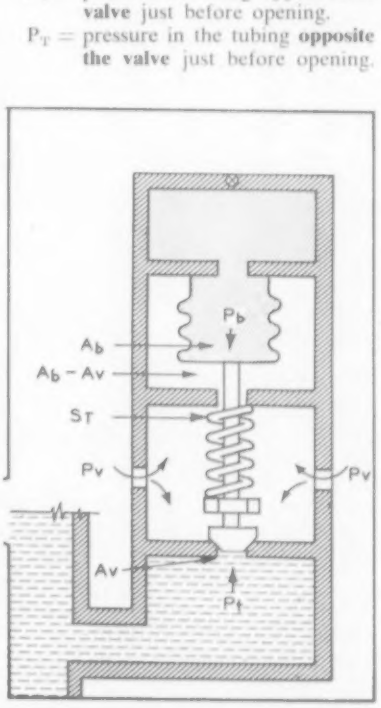


Fig. 1—Area of the valve port, A_v, and effective area of the bellows, A_b, together fix the spread of the valve itself.

S_T = effective spring load in psi.

A_B = total effective bellows area.

A_V = area of valve port.

Now, since $F_c = F_o$, dividing both sides by A_B, and solving for P_V:

$$\frac{P_V (A_B - A_V)}{A_B} + \frac{P_T (A_V)}{A_B} = \frac{P_B A_B}{A_B} + \frac{S_T (A_B - A_V)}{A_B}, \text{ or}$$

$$P_V = \frac{P_B}{(1 - A_V/A_B)} + S_T - \frac{P_T (A_V/A_B)}{(1 - A_V/A_B)} \quad (1)$$

Note from this equation that the term $P_B/(1 - A_V/A_B)$ is simply the pressure necessary to **overcome** the bellows charge alone at operating temperature. Also note that the full effect of the spring, S_T, must be overcome and that the tubing effect in opening the valve is **greater** than the tubing pressure multiplied by the (A_V/A_B) ratio.

Closing pressure . . . For the closing pressure, consider that the valve is open and the casing pressure is operating over the total effective bellows area. Again F_c is equal F_o, so:

$$F_c = P_B A_B + S_T (A_B - A_V)$$

$$F_o = P_V A_B$$

and equating, dividing by A_B and solving for P_V:

$$P_V = P_B + S_T (1 - A_V/A_B) \quad (2)$$

Note from this relation, first, that the closing pressure of the valve is a **constant value** because it is dependent only upon the pressure inside the bellows (which is constant at constant operating temperature) and a constant fractional effect of the spring. The pressure inside the bellows can easily be determined by multiplying the pressure necessary to overcome the bellows charge alone, corrected to operating

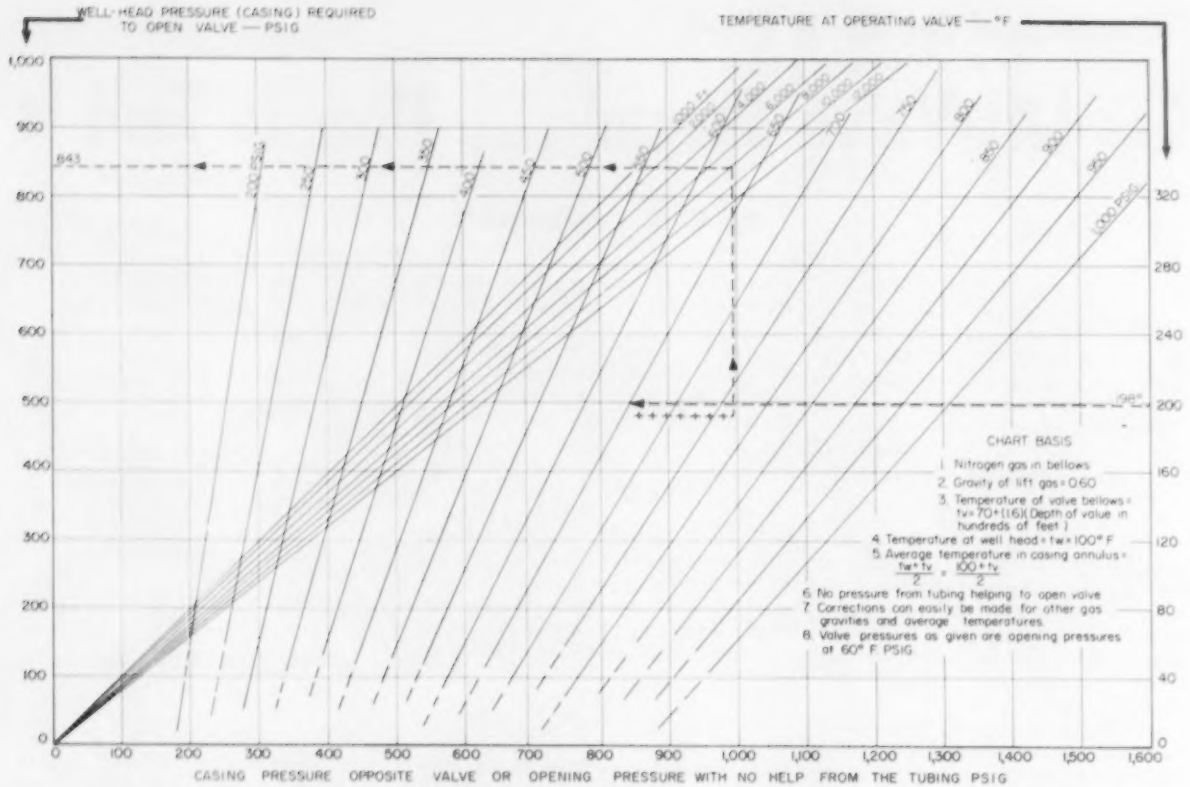

WELL-HEAD PRESSURE (CASING) REQUIRED TO OPEN VALVE — PSIG
TEMPERATURE AT OPERATING VALVE — °F
CASING PRESSURE OPPOSITE VALVE OR OPENING PRESSURE WITH NO HELP FROM THE TUBING PSIG
CHART BASIS
1. Nitrogen gas in bellows
2. Gravity of lift gas = 0.60
3. Temperature of valve bellows = tv = 70 + (1.6)(Depth of value in hundreds of feet)
4. Temperature at well head = tw = 100° F
5. Average temperature in casing annulus = (tw + tv)/2 = (100 + tv)/2
6. No pressure from tubing helping to open valve
7. Corrections can easily be made for other gas gravities and average temperatures.
8. Valve pressures as given are opening pressures at 60° F PSIG
845
200 PSIG
1000 PSIG
200°

Fig. 2—This chart may be used to find what valve in a gas-lift well is operating. Correction is necessary for the gas gravity and average well temperature only.

temperature, by the $(1 - A_V/A_B)$ term. Then, this closing pressure opposite the valve can easily be converted to the surface casing pressure.

The fact that the closing pressure is a constant value means that, if the valves can be spaced with an appreciable difference in their closing pressures, the operating valve can always be determined from surface data.

Problem . . . To show how these principles work, we will take an 800-psi. at 60° F. bellows valve with a 150-psi. spring. Valve is at 8,000 ft. in a well, where the operating temperature is 200° F. The valve has a ⅛-in. port and a A_V/A_B ratio of 0.11. Assuming a tubing pressure opposite the valve of 300 psi. and using a lift gas with a gravity of 0.60, we will determine: (1) Minimum casing pressure at the surface to open the valve, and (2) closing pressure of the valve as reflected at the casing well head.

Solution . . . The pressure necessary to overcome bellows alone at 60° F. is 800 — 150 or 650 psig.

From Fig. 2, we may find the surface pressure needed to open the valve with no help from the tubing. Proceed as follows:

1. Enter the chart at 200° F. and follow to the intersection with the 650-psig. line. We read a value of 845 psig.

2. Add to this value the 150-psi. spring pressure. We get 845 + 150 = 995 psig. This is the P_V value we would get from Equation 1 if there were no help from the tubing.

3. Now proceed upward to the 8,000-ft. curve and read across to the casing pressure at the surface. This value is 845 psig. and would be the opening pressure of the valve, if there were no help from the tubing.

4. Multiply the tubing pressure by the term $(A_V/A_B)/(1 - A_V/A_B)$ as given by Equation 1 to get the tubing help:

$$(300)\ [0.11/(1 - 0.11)] = 37 \text{ psig.}$$

5. Subtract the tubing help from the 845 and get a value of 808 psig., and this is the first part of our answer.

6. To get the closing pressure, note from Equation 2 that it is dependent only upon P_B and S_T $(1 - A_V/A_B)$.

7. To get P_B at operating temperature and depth, determine the pressure necessary to overcome the bellows alone at 60° F. That is 800 — 150 = 650 psig. Multiply this term by the expression $(1 - A_V/A_B)$. This gives the pressure inside the bellows at 60° F. or (650) (1 — 0.11) = 578 psig. From the combination chart at the intersection of the 200° F., and 578 psig. bellows curve read 750 psig.

8. Add (150) (1 — 0.11) = 134 [this is the S_T $(1 - A_V/A_B)$ term in Equation 2] to the 750 psig. and get 884. This is the closing pressure opposite the valve as given by Equation 2. Proceed up the chart to the intersection of the 884 psig. and 8,000-ft. curve and read across the 750 psig. This is the surface closing pressure of the valve and is the second part of our answer.

So this valve, under the given operating conditions, has a spread of 808 — 750 or 58 psi. between opening and closing pressures.

LAST OF THE SERIES . . . This article is the last of the series by Professor Kirkpatrick. The other articles in this series appeared in the issues of March 29, August 30, September 13, September 27, October 18, November 29, 1954, and January 3, January 17, and February 7, 1955.

Radioactive Sources: Big Aids for Weld Inspection . . . But . . .

HANDLE WITH CARE!

by W. W. Thayer

INDUSTRIAL radiography is the science of using penetrating radiation in conjunction with film for inspecting the subsurface areas of opaque materials. This radiation consists of many short wave length rays of light or electro-magnetic particles of energy and are usually termed X-rays and gamma-rays. These rays have such a short wave length they are capable of penetrating several inches of steel.

X-rays are produced by an electric discharge in a vacuum tube and impinging against a target. Gamma-rays are the spontaneous emissions from a radioactive material and are produced by an unstable condition within the atom of the material.

The industrial use of these rays is to inspect the subsurface areas of a subject without destroying it. This is done by exposing film through the subject. The exposed films are generally referred to as radiographs, gammagraphs, and X-rays.

Radiographs are actually produced by these rays passing through a metal and exposing a film placed against the opposite side of the metal. Where voids or foreign matter less dense than the material being radiographed are present, a greater number of rays will pass through and expose the film more at that point. Therefore void defects will appear as dark spots or areas in the resulting graph. Additional deposits of metal will appear as light spots or areas in the graph.

Radium, cobalt 60, iridium 192, and cesium 137 are the most popular gamma-emitting sources used for pipeline inspection and other industrial radiography. Although all these sources emit gamma-rays, the intensities of the rays vary with each source.

Radium is the only source of this group that is radioactive in its natural state. A prepared radium source emits gamma-rays ranging from .24 to 2.20 m.e.v. (million electron volts) and has a half-life of approximately 1,650 years. These rays can readily penetrate several inches of steel and consequently are extremely difficult to shield under normal field conditions. One gram of unshielded radium (emitting about 8,400 milliroentgens per hour of radiation at 1 ft.) is recommended as the maximum safe quantity for general pipeline radiography.

The gammagraphs resulting from exposure by a radium source are only fair in quality. The density contrasts of the negatives are not great enough to produce the definition normally desired.

Artificial sources . . . Cobalt 60, iridium 192, and cesium 137 are commonly referred to as radioisotopes or artificial sources. The activity is brought about by creating an unstable condition within the atomic structure of the element involved. Normally this is done by bombardment from other atomic particles.

Cobalt 60 has probably been the most popular of these industrial radiographic sources because of its timely development, low cost, and availability. It has a very fine focal point and has a half-life of 5.4 years. Cobalt 60 emits gamma-rays with energies ranging from 1.17 to 1.62 m.e.v. The gamma-rays are difficult to shield with portable equip-

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ment. One curie of unshielded cobalt 60 (emitting about 14,400 mr./hr. of radiation at 1 ft.) is the maximum safe quantity recommended for pipeline radiography.

The gammagraphs produced by radiation from a cobalt 60 source are very similar to those produced from radium exposure.

Iridium 192 is a relatively new radioisotope in the industrial radiographic field. It emits gamma-rays with energies ranging from .137 to .650 m.e.v. but has a half-life of only 74 days. This isotope is probably the easiest of this group to shield and the safest to handle due to its low energies.

The gammagraphs produced from exposure by an iridium source are of good quality, with good density contrasts and consequently good definition. The low energies and fine focal point of iridium are responsible for these better-than-average graphs.

Three unshielded curies of iridium 192 (emitting about 17,325 mr./hr. of radiation at 1 ft.) would probably be the maximum quantity to be safely used for pipeline inspection. In some instances, however, shielded handling devices are employed so that much larger quantities are safely used.

Promising material . . . Cesium 137 is probably the least known in this group of radioactive sources, but it does have a very bright future. It has a half-life of 37 years and emits gamma-rays with energies of .662 m.e.v. This source is as easy to shield and as safe to handle as a similar iridium source. Cesium produces gammagraphs of the same quality as those produced by iridium.

Four and on-half curies of cesium 137 (emitting about 15,700 mr./hr. of radiation at 1 ft.) would be the maximum quantity to be used safely for pipeline weld inspection. Much larger sources are being used, however, with shielded handling devices.

An element is made radioactive by artifically unbalancing the structure of its atoms. This activity will continue until the atoms have resumed their natural state. The activity age of such an element is measured in half-life periods because of the prolonged process of its atoms regaining their equilibrium. The full life of an element's activity would be difficult to determine, and the knowledge would be of minor value to industrial radiography.

The radioactivity of a 1-curie source of iridium 192, for instance, would be only ½-curie or 500 mc. after 74 days. After another 74 days its activity would be 250 mc., and another 74 days would bring it to 125 mc. This decay scheme will continue almost indefinitely.

The radiation emitted by these sources is very dangerous, and much caution should be exercised to guard against overexposure. The actual amount of radiation the body can absorb without harmful results is somewhat vague. Therefore dosage limitations, known to be safe, are recommended and in most instances are enforced by governmental agencies. The Bureau of Standards recommends 50 mr./hr. per day or 300 mr./hr. per week as a maximum radiation dosage per person. These dosage limitations are generally accepted and abided by throughout this country.

Overdosage . . . The effect of overdosage on the human body depends largely on the amount of radiation the body receives. Minor overdosages tend to retard the blood-renewing process, which is normally done about every 3 months. Major overdosages of radiation could result in cancer, and extreme exposure could be fatal. It is, therefore, absolutely essential that each handler of radioactive sources be familiar with the danger involved, as well as with methods of controlling and guarding against overdosage.

Everyone using radioactive materials for radiographic purposes should be familiar with and employ gamma survey meters, dosimeters, film badges, and common sense.

Gamma survey meters are intsruments designed to measure in roentgens any gamma radiation present. They are used to determine the activity of a source, to check radiation fields, and to inspect the safeness of source containers. Gamma survey meters are also used to determine exposure time, to trace pipeline scrapers, and to inspect areas for contamination. These portable instruments are necessary equipment for radiation control.

Dosimeters are ionizing chambers which register gamma radiation in milliroentgens. They are similar in size and shape to a pocket pen. This instrument is to be worn on the person of any handler of radioactive sources. Exposures can be checked at any time by sighting through the dosimeter and reading the scale inside. This radiation check should be made frequently, and work with the source discontinued before the radiation reaches the dosage limitations. Dosimeters should be reset to the zero reading on the scale at the beginning of each work period or day. This is accomplished by aid of the accompanying recharging unit.

The film badge is a small flat container with varying thicknesses of metal into which is inserted a film cassette. This film will determine the weekly radiation dosage of its wearer. Each film is worn on the person at all times during a 1-week work period. These film are processed by the laboratory furnishing the film badge service. A film badge service furnishes an accurate and permanent record of weekly radiation dosages.

Precautions . . . Blood counts are recommended at 3-month intervals for those working with radioactive materials. A blood count is also recommended as the first step for those starting to work with radioactive material. For radiation dosage control, blood counts must be made by a reliable clinic and over a period of at least 1 year. Individuals should attempt to have these counts made at the same time of day in relation to eating heavy meals for the most accurate information.

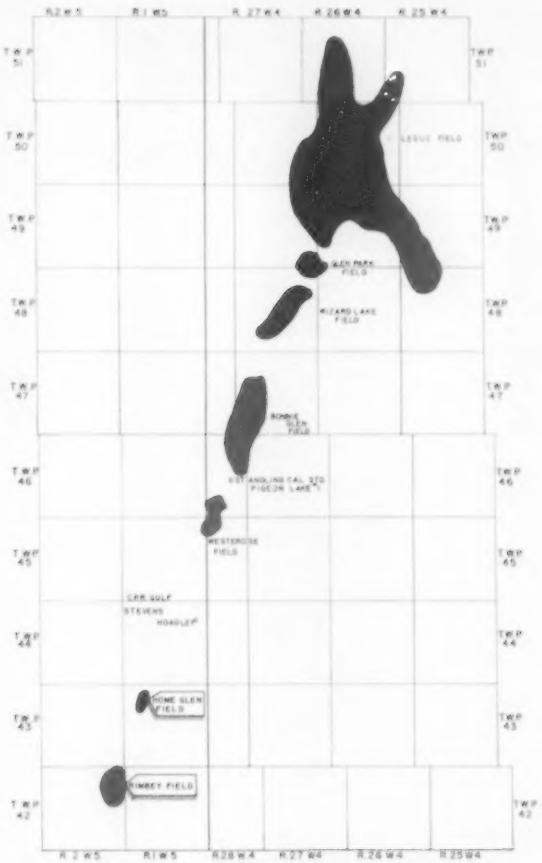
Common sense or intelligent handling of radioactive sources is probably the most important factor in the control of excessive radiation. There are many ways to prevent over-dosages and individuals are encouraged to practice these. Many objects which are capable of absorbing radiation may be utilized. Entering and leaving the radiation field hurriedly and always being aware of the hazards involved are points to remember. Handling the source at the maximum possible distance is good practice.

Carelessness on the part of the handler is probably the biggest single cause of excess radiation. Working in a congested area is another cause for over-dosages as the radiographer tends to stay in the radiation field so as to warn others. This should not be done, and the source should not be used under these conditions. Such radiographic work can be carried on before or after regular working hours, or barricaded against such intrusions.

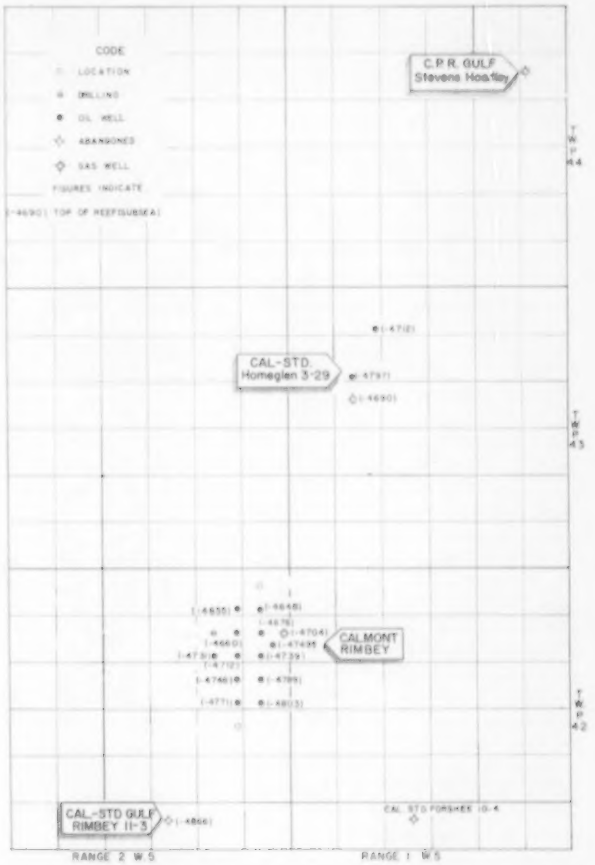
The radiologist is responsible for the safety of other individuals who may enter the radiation field of his source. Precautions should be taken to isolate the area where a source is in use. This can be done by the use of barricades, ropes, and danger signs.

All radioactive sources should be kept in their respective safes while not in use. These safes should be so constructed that not more than 6 mr./hr. of radiation can be encountered at the nearest point of contact. These safes should be equipped with locks other than those on the doors of the building or the truck housing the source. Radioactivity danger signs should be displayed liberally at any approach to these safes.

Radioactive materials may be shipped by Railway Express or Air Express, but in either case the radiation at the surface of the container should not exceed 6 mr./hr. These shipping containers should be labeled clearly with radioactivity danger signs.



THE CHAIN of Devonian reef fields extends 55 miles, from Leduc southwest to Homeglen and Rimbey. Fig. 1.



DEVELOPMENT at Rimbey-Homeglen has outlined a large reservoir that may prove to be more than 16 miles long. Fig. 2.

Here's why Canadian operators are running into . . .

Unusual Problems in Developing a Reef Trend

Large gas reserves, thin oil column have resulted in coning; Rimbey-Homeglen experience supports Gussow's theory

by W. J. McPherson

LARGE gas reserves and a thin oil column in the Devonian reef at the Rimbey-Homeglen field have resulted in difficult completion and production problems as the reservoir is developed. Coning of water and gas into producing wells has occurred, and in one instance, coning of both water and gas was observed in the same well.

Rimbey-Homeglen is the deepest Canadian reef field in a chain that extends from Leduc southwestward, a distance of 50 miles (Fig. 1). Gas production at this field supports Gussow's theory that accumulation of gas can be expected from a given reservoir in downdip fields, whereas the updip fields will produce oil. This principle may serve as a guide for gas prospecting in other areas.

Author is chief engineer, Calvan Consolidated Oil & Gas Co., Calgary.

Location and Extent . . . The Rimbey-Homeglen accumulation is the most southerly in the long trend of Devonian-reef reservoirs extending south-southwest from Leduc field (Fig. 2).

This trend has been used as an illustration by Gussow[1] in his theory about the entrapment of oil. The updip reservoirs are full of oil and the lower reservoirs have larger gas caps going downdip. The reef trend angles down the regional dip which is westerly. The reefs are encountered at successively lower levels going south-southwest. The elongate form of the reservoirs in this trend is quite apparent. The width averages between 1 and 2 miles, and the same could hold for Rimbey-Homeglen.

The C.P.R. Gulf Stevens Hoadley No. 12 well drilled into a Devonian reef which may or may not be the same reef. As it is considerably updip from the Rimbey-Homeglen, the oil zone would lie relatively lower in the reef

section and porosity may be lacking at the appropriate subsurface interval. The well does not appear to have been tested across this interval, but obtained wet gas above this elevation which may correspond to the gas cap of Rimbey-Homeglen.

The upper surface of the reef is irregular and the few wells drilled do not permit the construction of an accurate contour map. The gas cap should be thicker going updip along the trend, and the thickest well does exist in the Homeglen area—California Standard 3-29 at 408 ft. of gas cap, double any other present well. However, the well between it and the Rimbey group has a thinner gas cap than some of that group. Gas-oil contacts in all these wells check rather closely, and the fact that the oil zone seems to have about the same thickness in both areas further suggests that a single accumulation is involved.

Seismic interpretation is complicated by the wedging edge of the Mississippian formations which lie to the west and pinch out in this general area. There are insufficient wells in the reservoir, or its vicinity, to permit contouring of the pool, which appears to be irregular in its buried topography. It appears that only a rough estimate is possible at this time. The Rimbey group of wells suggests that the pool is at least 2 miles in width. A long, narrow pool 12 by 2 miles would have an area of some 15,000 acres, and some of the preceding speculations suggest that this figure could be exceeded.

"There are insufficient wells in the reservoir or its vicinity to permit contouring of the pool, which appears to be irregular in its buried topography."

Reservoir Characteristics

The reservoir has a thick gas cap which gave high recoveries of distillate on drill-stem tests. Pressure-volume-temperature data has not yet been investigated because the gas is still a deferred asset. Some separator tests have been run and a recombination made by Madison Laboratories, but no figures are generally available. Distillate recoveries of 40 bbl. per M.c.f. and upwards are reported. The specific gravity of the gas is in the neighborhood of 0.8°. The analyses of produced gas exhibit considerable variation. They usually run about 75 per cent methane, with small amounts of nitrogen, carbon dioxide, and hydrogen sulphide.

The salt water from this reservoir is very saline. The gas-oil contact occurs at about 4,854 ft. subsea, and drill-stem tests on all wells agree rather closely. Some small variations can be accounted for where there is a slight disagreement in kelly bushing elevations, and a few wells encountered a "tight" zone in the vicinity of the contact. This proved beneficial in the completion of these wells; they were able to produce from a point close to the gas contact and stay well above the water. In their initial stages, at least, these wells have no difficulties with gas-oil ratios.

Information on the oil-water contact is available only from drill stem tests on the initial wells which drilled entirely through the oil zone. The wells which produce water are in this group, which is a potent argument for the shallower "open-hole" completions succeeding them. There is little uniformity on the drill stem tests across the oil-water contact. The difference cannot be accounted for by slow versus rapid-opening test tools. An oil-zone thickness of 25 feet has present general acceptance for M.P.R. purposes.

Coning . . . It has been suggested that the indefinite results on some of these drill-stem tests may result from downward coning of oil and upward coning of water. Production histories indicate that the completed wells are sensitive to coning. This could be expected from the high drawdowns shown by bottom-hole flowing tests. As previously mentioned, the earlier pressure tests were somewhat erratic. But pressure drops of 600 psi. and more occurred at production rates around 175 bbl. per day. Productivity indices of 0.3 to 0.5 were measured in wells having from 2½ to 6 ft. of perforations or open hole. Because of the thin zone, operators have not resorted to large acid treatments or fracturing to increase the permeabilities around the well bore.

Core data . . . All wells are diamond cored in the oil zone, and laboratory analyses were run on the 3½-in.-diameter cores for porosity and radial and vertical permeabilities. Most wells omit coring of the gas-cap interval.

Core analyses indicate that high values of permeabilities exist, but they are interspersed in relatively narrow bands with extremely low permeabilities. The arithmetic average of laboratory permeabilities to air is quite high. They may exceed 1,000 millidarcies, but the drawdown tests and production experience indicate the reservoir permeabilities to be far from favorable. The permeability profile is quite irregular, and zones of several darcies occur side by side with other narrow zones of less than 1 millidarcy.

These tight zones have proved advantageous when occurring in some wells at the gas-oil contact, which suggests that they must be fairly continuous laterally. Most of the wells without this feature appear to be rapidly approaching the gas-oil penalty figure of 2,000 cu. ft. per bbl. Some wells have already reached this figure. The values of vertical permeability are considerably less than the radial (horizontal) permeabilities.

As additional wells are cored, it becomes increasingly evident that considerable variation exists from well to well. The individual analyses generally vary between 3 and 20 per cent, with some higher and lower values. This wide distribution has considerable effect in that it does not tend to average out over the relatively thin oil zone. The poorest well averaged about 5.5 per cent porosity and produced gas without appreciable oil when completed.

The lower permeabilities go with low porosity. This may have resulted in an extreme case of the high drawdowns previously discussed. The best well had an average porosity exceeding 10 per cent. The total footage of core is not large because the newer completions do not penetrate the zone very far. The weighted average calculated for the Rimbey Field at the last M.P.R. hearing was 8.3 per cent. Inclusion of the Homeglen wells would result in about the same figure. This figure has been successively reduced from the earliest hearing, but may be leveling off.

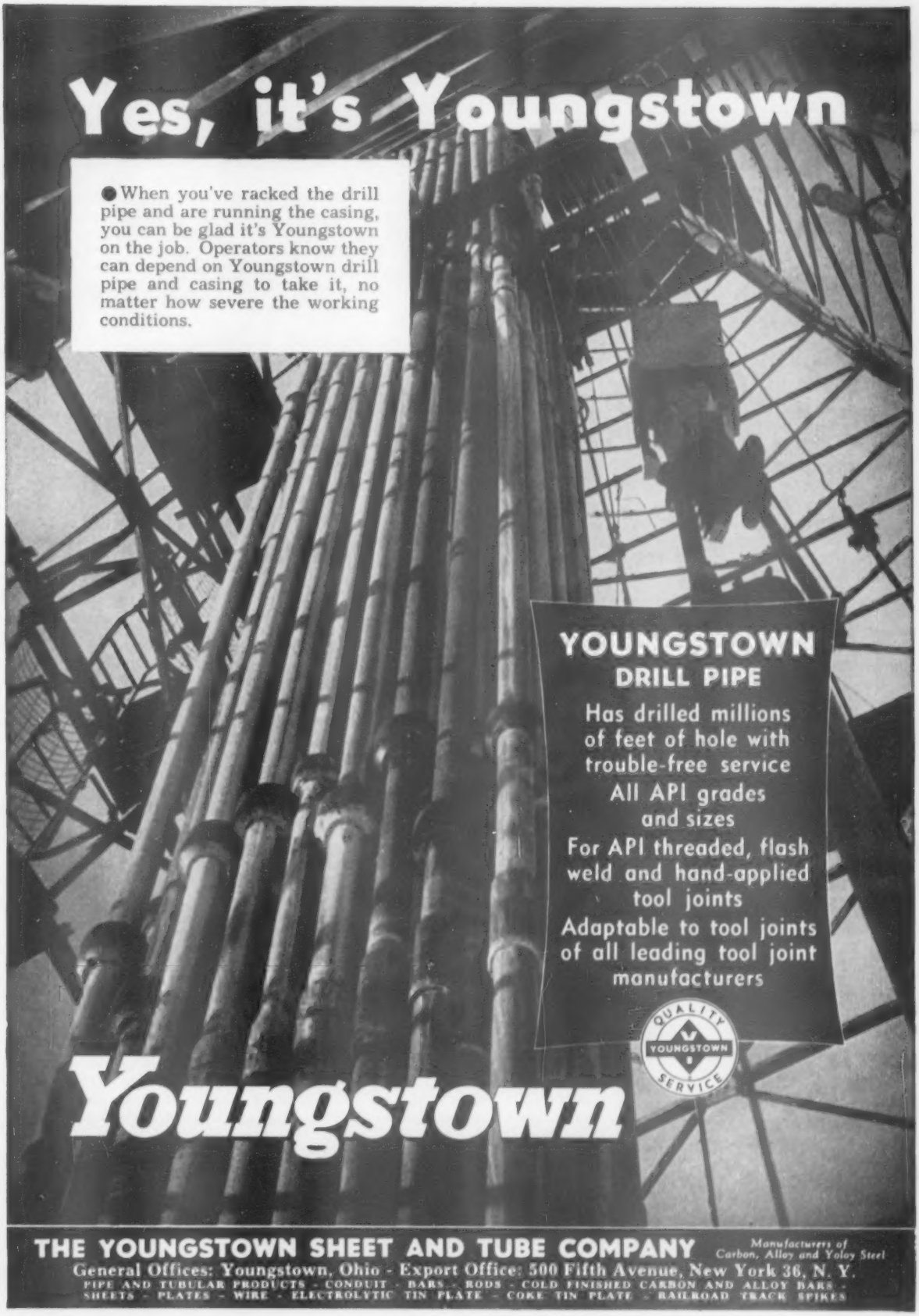
Water saturations are available from one well which cored the oil zone with oil-base mud. This was an open-hole completion and only eleven feet of core was available. The average water saturation was 12.64 per cent. The minimum porosity of 2.6 per cent contained 28.1 per cent water saturation, and the highest porosity of 26.2 per cent had only 3.2 per cent water saturation.

Drilling

The area has a rolling glacial topography and kelly bushing elevations vary over a range of 250 ft. One well drilled deeper to explore lower horizons, but the average depth for the other wells is not far short of 8,000 feet. The wells start in glacial drift above the Tertiary Paskapoo formation, and drill about 6,000 ft. of Cretaceous sections before encountering Mississippian and Devonian shales and limestones. No formations above the Devonian reef have provided encouragement to date.

The earlier wells had extensive coring and testing programs, and drilling rigs were over the hole for a considerable time.

With practices more or less standardized, present wells may require 60 to 75 days for drilling. Time on bottom for 9-in. hole should run in the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neighborhood of 550 hours and require approximately 65 rock bits. Wells using jet bits have reduced this to 50 or less bits.

Some of the earlier wells were very expensive. A recent recapitulation, which omitted the high costs of initial wells, resulted in a figure of $160,000 for drilling and completing an average well. This does not include $27,000 for lease equipment for a single-well battery. This is an average—some wells have achieved considerably lower figures.

Drilling regulations call for 600 ft. of surface casing, and glacial gravels and boulders necessitate some precautions in drilling surface hole. Some lost circulation has been experienced, so that the addition of some commercial mud is good insurance. Hole diameters below surface casing are 9-in. Lost circulation has not been a problem, although the D-2 zone appears to take small amounts on occasion. Some operators run 7-in. casing before drilling the gas cap, while others have drilled through it before setting casing without experiencing any difficulty. Casing is cemented about 3,000 ft. to cover the Cretaceous Viking zone as required by regulation.

Mud costs low . . . Mud programs must include provision for drilling anhydrite in the Devonian section and control of a long section of Colorado shales above the Viking zone. These shales have a tendency to sluff, but the situation is not difficult to control and successful programs have cost less than $5,000. Oil-emulsion muds, either gypsum-base or lime-base, are satisfactory.

The latter type was used in a well that stood nearly a month on two occasions with this Cretaceous section exposed, and the section gage showed the final result to be close to bit gage. Oil-base mud has been used in some completions.

Completions and Production

Completion in the oil zone has turned out to be a considerably greater problem than might be expected, even for a zone of 25 ft. Three of the present completions will produce only gas or water. Of the twelve wells producing in September, seven produced free gas and two produced water. Only four were producing the current allowable of 128 bbl. per day. Of the remaining eight, probably only two others would be capable, but they must be restricted because they produce water. The other six appear incapable either through sheer inability or through obtaining large gas volumes even at low rates of production. Since considerable voluntary restriction is imposed by some producers, it is not easy to make absolute comparisons between wells.

The coning of gas or water, and in one case both, is a problem in nearly all wells at the present allowable rates. At somewhat higher rates of production, the better wells would be involved in these problems also. Some wells have been produced experimentally at increasing rates and pulled in water above 175 bbl. per day. Reducing the rate eliminated the water, so that while coning is sensitive to the rate, it is not permanent. The two wells producing water started with high percentages which declined under steady production rates. The earliest one starting at about 60 per cent has apparently stabilized at 26 per cent. The latest one has not had more than 4 months of relatively continuous production, and in that time water production dropped from 90 per cent to 45 per cent.

A trend towards excessive gas-oil ratios appears to be fairly general, but total production history is brief due to workovers on many wells and the loss of much production time when the oil could not be trucked out for weeks at a time because of the unusually heavy rainfall in Alberta this year. No pipeline facilities are available nearer than the Bonnie Glen Field to the north.

The initial completions, with one exception, were in wells cored and tested through the oil zone. These are the wells which now produce water or are susceptible to water coning. In some cases, the 7-in. casing is set to bottom. Other operators ran the 7-in. casing before drilling the gas cap, and ran 5-in. liner to bottom. Completion is by perforations in a narrow zone about midway in the oil zone. Some of the wells were squeeze-cemented above or below the producing interval either prior to or after opening the production perforations.

No complete successes were obtained. But three failures as commercial producers are in this group, as are two which have high water-cuts. The others will apparently cone water at higher production rates. In addition, one well has already reached the maximum gas-oil ratio permitted. In addition to the three failures, this group contains five of the twelve producers, including three of the best six producers.

Barefoot completions . . . The more recent wells are drilled from 11 to 16 ft. into the oil zone and completed openhole. In some cases, the production casing is landed several feet into the oil zone, but usually the production casing is set as soon as the gas cap is contacted. The well is then drilled to total depth and the gas cap left uncased. The gas cap is excluded from production by setting a packer on the tubing below the gas-oil contact and filling the annulus with mud or oil-base mud. This arrangement allows the production interval to be varied by resetting the packer as desired.

This type of completion appears to avoid complications as far as the salt water is concerned. It has been particularly successful in wells which had a zone of tight permeability right at the gas-oil contact. One such well commenced production with a low gas-oil ratio from a point 5 ft. below the gas cap. These wells, as a group, have the least production history and the method has not yet been fully evaluated. There is some suggestion that this group is more susceptible to high gas-oil ratios, probably because they are usually completed rather high.

High G.O.R. . . . Though the increase in gas-oil ratio is apparently a general trend in both types of completion, it does not necessarily indicate a wholesale breakthrough of the gas cap. But it may be an indication of early decline of the field. The freedom from water troubles in open-hole completions is a considerable point in their favor, and it appears that this type of completion is in favor at this time. There is some reason to believe that the success of any well is related in large degree to the porosity and permeability profile along the well bore where it penetrates the oil zone.

There must be a large volume of oil in this reservoir, but it may be difficult to produce. However, the gas cap need not be totally deferred while waiting to produce the oil. The production history of the oil zone, while not too encouraging, is still too brief for final conclusions. There is a suggestion of a trend towards increasing gas-oil ratio, even at this early stage, while could presage an early decline in productivity. The tremendous amount of reservoir energy in the gas cap might be manipulated to produce a considerable amount of oil as a byproduct and to offset this decline to some degree.

Considerably more production history is necessary before the oil possibilities can be evaluated.

The knowledge to be gained from additional completions, and possibly some recompletions, should assist in completion and production techniques. The behavior under high gas-oil ratio production, when gas-gathering facilities are available, will also provide information regarding the oil recoveries to be expected.

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Well Developed...

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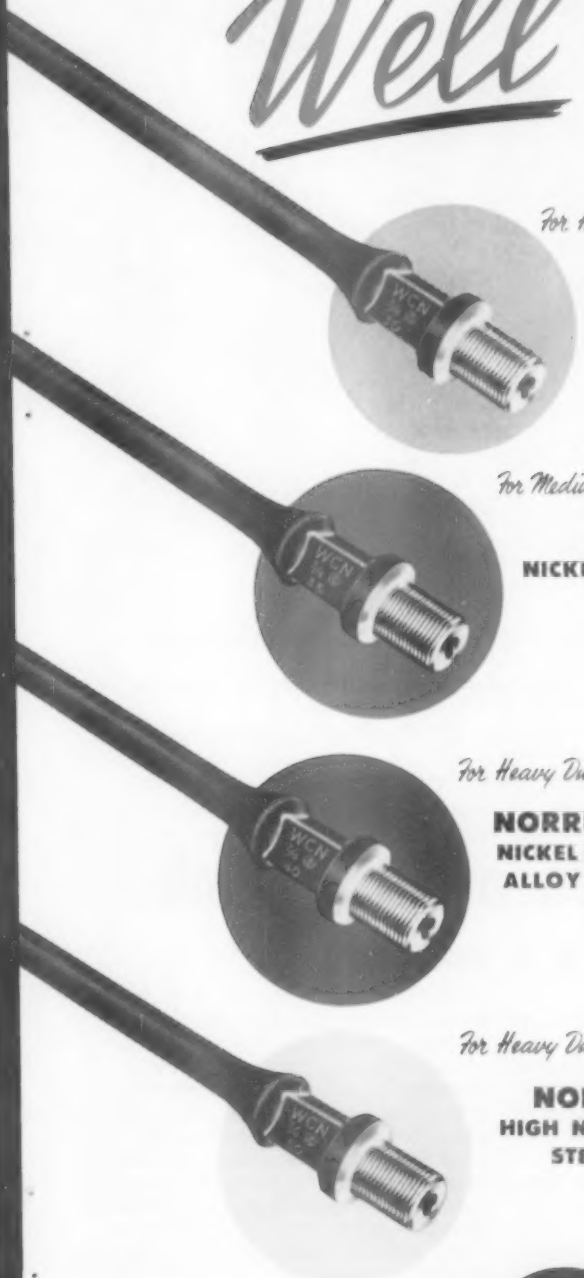

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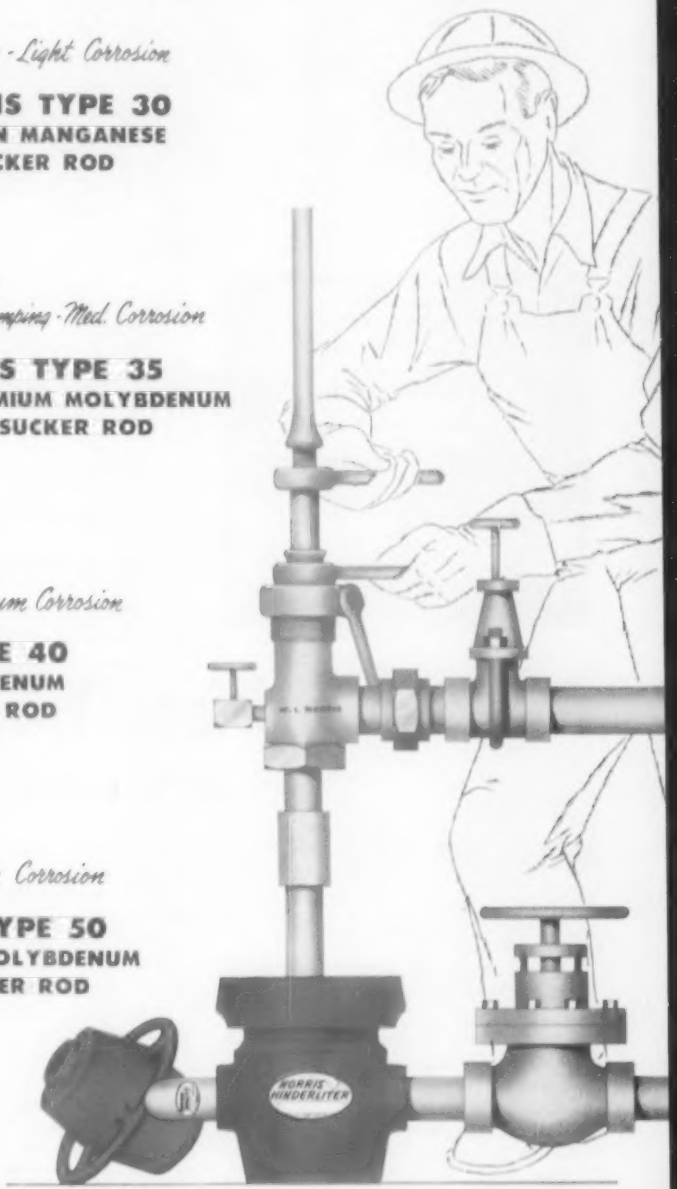

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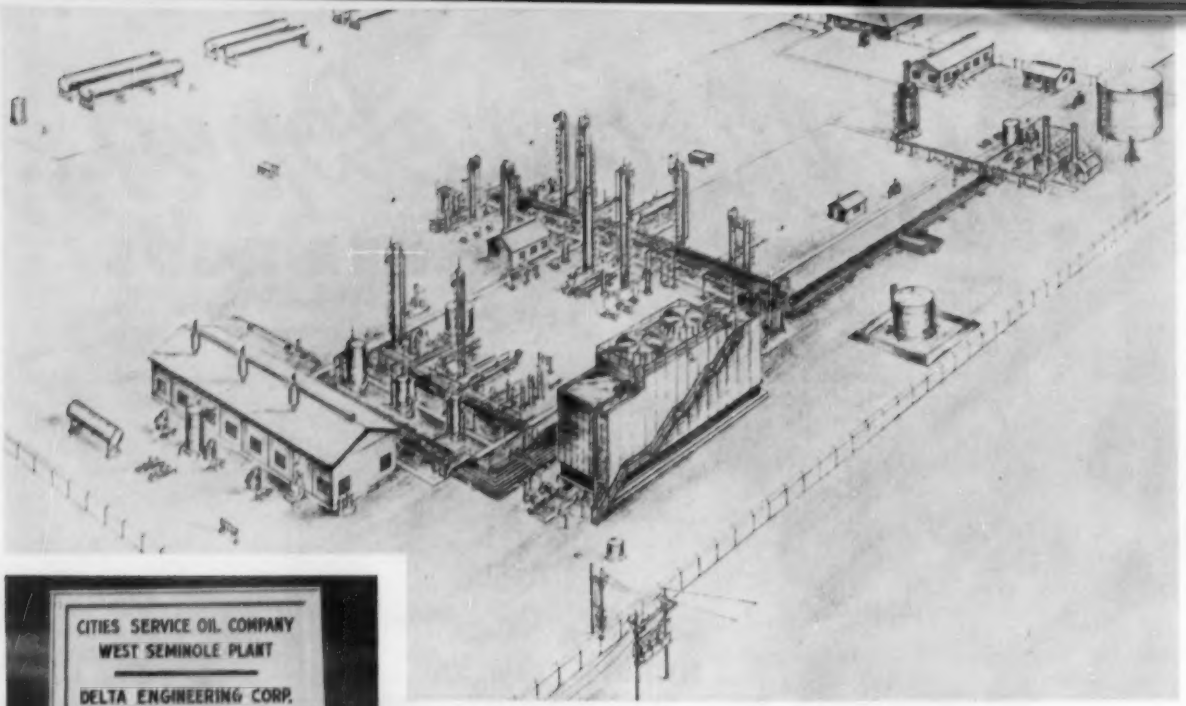


Plant layout is compact and so arranged that it is operated by only 2 men per tour and a total operating and maintenance force of 22. Plant is operated from a central control room with latest instruments.

Perforated Plate Trays Do a Better Job

by Guy W. Duren, Jr. and B. O. Buck

DESIGN of the West Seminole gasoline plant includes some of the latest plant innovations. Among these are:

1. Partial demethanization in the absorber reboiler.

2. Universal application of perforated plate trays for all process vessels including absorber, rich-oil deethanizer, amine treater, fractionators, and caustic treater.

Removal of acid gases is accomplished between the first and second stages of compression. This leads to a saving in horsepower.

The West Seminole field gasoline plant, operated by Cities Service Oil Co. and located 8 miles west of the old Seminole field in Gaines County, Texas, started operations November 1, 1954. The plant is designed to gather and process casing-head gas from West Seminole field and is at present being expanded to permit processing additional gas from Russell field, situated approximately 8 miles to the northwest. This new plant is jointly owned by Cities Service Oil Co., operator; Atlantic Refining Co.; Burdell Oil Co., et al.; Magnolia Petroleum Co.; Superior Oil Co.; Sinclair Oil & Gas Co.; Shell Oil Co.; and Great Western Drilling Co.

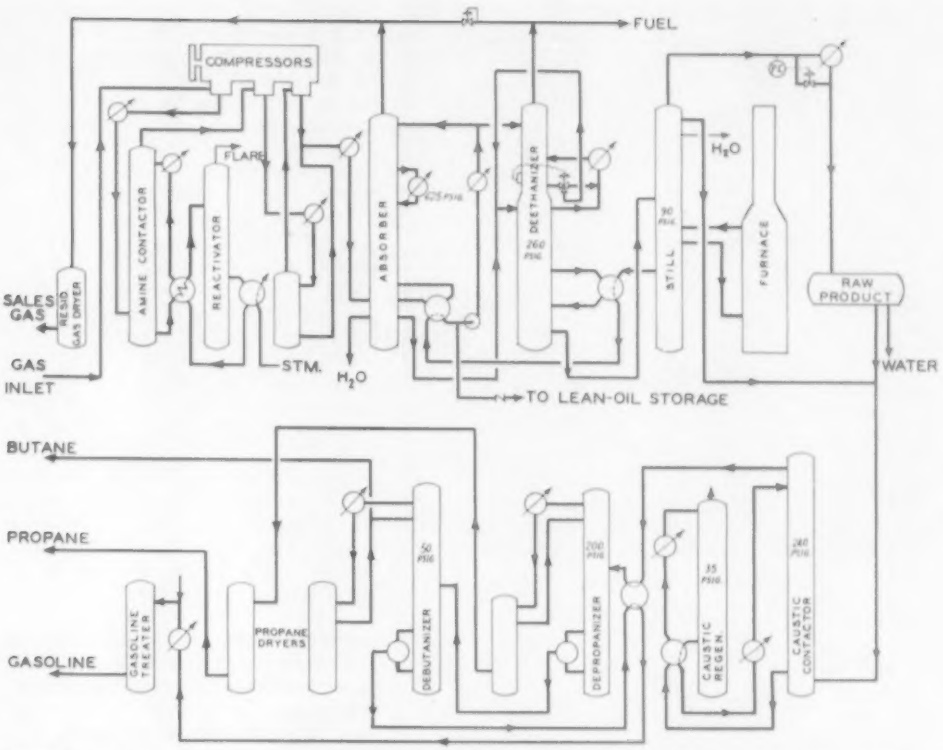
Russell field facilities . . . These are a separate joint project operated by Shell. They will gather gas in Russell field, compress and deliver it to the West Seminole plant at plant pressure for treating and processing. Russell field facilities are expected to be in service in April. On a design basis, the plant can process 15 million standard cubic feet per day of gas with 75 per cent propane recovery, and ultimately can process 21 M.M.s.c.f.d. of gas, producing approximately 75,000 gal. propane, butanes, and natural gasoline daily.

Processing

West Seminole field gas, from the San Andres formation, is separated from its crude oil in one stage at approximately 15 psig. and transported to the plant slightly above atmospheric pressure.

Compressors . . . Gas-compression facilities are three 880-b.hp. units designed to compress 10 M.M.s.c.f.d. of West Seminole gas in three stages from 3 to 625 psig. The compressors' cylinders are equipped with hand-operated clearance pockets and intake-valve lifters providing a high degree of flexibility. At increased suction pressure, these unloading devices provide capacity to compress 13.5 M.M.s.c.f.d. Auxiliary equipment consists of full-flow oil filters, thermostatically controlled water and oil coolers, and automatically operated shutdown devices for safe and efficient operation.

The field gas contains 7.5 per cent acid gases, consisting of 1,500 grains of hydrogen sulfide per 100 cu. ft. and the remaining 5.1 per cent carbon dioxide. Removal of these components is accomplished following the first stage compression at approximately 45 psig. Installation of acid-gas removal facili-



PERFORATED TRAYS are used for all process vessels, including absorber, deethanizer, amine treater, fractionators and caustic treater at the West Seminole gasoline plant operated by Cities Service Oil Co.

ties between the first and second stages results in a saving of 8 b.hp. per million cubic feet of gas over an equivalent installation at the second-stage discharge.

M.E.A. unit . . . Removal of the acid gas is accomplished by means of a 15 per cent monoethanolamine-water solution. Contact of amine with gas is made in a 5½-ft.-diameter vessel containing 20 trays spaced 2 ft. apart. Perforated plate trays are utilized in the contactor, as well as all other tray-filled columns in the plant. Solution rate is 14 g.p.m. per M.M.s.c.f.

The flow of spent and regenerated amine solution is conventional. Liquid from the base of the contactor is heated by exchange and admitted to the regenerator, which is a 4-ft.-diameter column with 20 trays on 2-ft. spacing. Carbon-steel tubes are used in the regenerator reboiler, heat exchangers, and solution coolers. Because of the relatively large carbon dioxide removal required, a design temperature of 280° F. was chosen for the regenerator bottoms. Use of low-pressure steam in the reboiler should mitigate reboiler corrosion problems through maintenance of low skin temperatures.

Regenerated solution is passed through the heat exchangers to the solution surge tank. A small stream of sweet gas enters the latter vessel and blankets the solution to prevent air amine reactions. From the surge tank the solution is pumped through a cooler, filtered, and admitted to the contactor. A thermostatically controlled valve bypasses the cooler with sufficient solution to prevent the cooling and condensation of hydrocarbons within the contactor.

Sweet gas from the amine contactor is compressed through the final two stages and admitted above the third tray of the absorber. Condensate formed in the second-stage cooler is pumped into the third-stage cooler, and the combined mixed phase stream passes through a condensate separator before entering the absorber.

Condensate separator . . . The separator on the stream is now used for water removal only but was installed for future expansion. When operating under design conditions, Russell field gas and condensate will enter the plant in a common pipeline at a pressure sufficient to allow processing of the gas in the absorber. Prior to entering the absorber, the vapor and liquid phases will be separated and both streams treated for hydrogen sulfide removal. Gas from the separator will be sweetened in a 24-in. contactor by monoethanolamine solution from the existing plant treating system.

Liquid from the separator will be

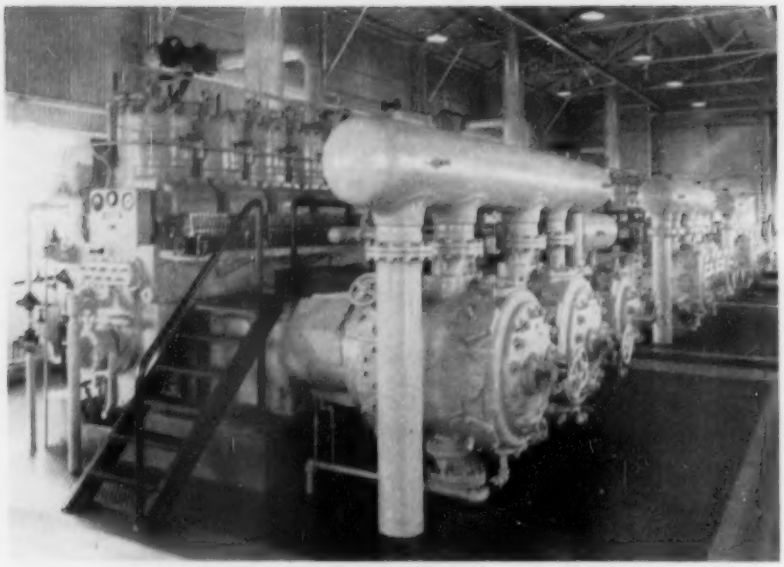
THE AUTHORS

G. W. DUREN, JR.

B. O. BUCK

Guy W. Duren, Jr., is plant superintendent of the West Seminole gasoline plant. In 1948 he received a bachelor of science degree in chemical engineering from Texas A. & M. Upon graduation he joined Cities Service's junior engineer training program. Upon completion of this course he was assigned the post of district engineer for Kansas plants at Wichita. Later he was employed as a process engineer in Bartlesville, and then as operations superintendent at the Ambrose gasoline plant at Blackwell, Okla. He remained in the latter position until his assignment in 1954 as plant superintendent of the West Seminole plant.

B. O. Buck is senior process engineer for the Cities Service Oil Co.'s gasoline-chemical division in Bartlesville, Okla. He joined Cities Service in 1948 following graduation at University of California at Berkeley, as a bachelor of science in mechanical engineering. After completing his company's junior engineers training program he was assigned as district engineer for Texas plants, with headquarters in Pampa. Since 1952 he has been employed in the Bartlesville office. During the design and construction of the West Seminole gasoline plant he served as the project manager.



THREE 880-HP. compressors are used in gathering West Seminole field gas.

treated in a similar column by amine solution, the latter serving as the continuous phase.

Treated condensate is recombined with the treated gas and commingled with the West Seminole stream before reaching the condensate separator. Whereas the condensate is now admitted to the absorber with the gas, future conditions will require installation of a separate "condensate stripper" for methane and ethane removal, the gas from the stripper being admitted to the base of the reabsorption section of the existing rich-oil deethanizer and the stripped condensate being admitted to the still rectifying section.

Partial demethanization . . . Conservation, by exchange, of lean-oil heat in an absorber reboiler permits partial demethanization at the absorber. Subsequent rich-oil deethanization allows total condensation of the still overhead, thereby resulting in the use of only three tray-filled pressure vessels in the absorption-distillation cycle, thus eliminating the need for flash tanks, reabsorber, or recompressors. Use of the still overhead accumulator as a combination raw product-still reflux drum results in a simplification of plant layout and operation.

Absorption

The absorber is equipped with 28 perforated trays on 2-ft. spacing and operated at 625 psig. Design lean-oil rate is 126 g.p.m. of 180 mole weight oil. An intercooler, located in the cooling tower, provides cooling for rich oil between the twelfth and thirteenth trays. Receiving its heat from the lean oil the absorber reboiler maintains a temperature of approximately 220° F. at the base of the column. Gas entering above the third tray permits the lower three to serve as stripping trays for partial demethanization.

Absorber residue gas, after passing through a scrubber, is dehydrated by solid desiccant prior to entry into the sales pipeline.

Deethanizer

Rich oil from the absorber enters at the top of the rich-oil deethanizer stripping section. The column is in two sections, the lower being 4 ft. in diameter and the upper 2½ ft., each containing 20 trays spaced 18 in. apart. The two sections are externally connected and are operated at 250 psig. Stripped gas from the lower section passes through a cooler prior to being admitted to the reabsorption section. Rich oil from the upper section is pumped into the feed line to the column, some being recirculated with the stripped gas to the cooler and returned to the base of the upper section. Design lean-oil rate to the column is 44 g.p.m.

Advantages of Partial Demethanization in Absorber

Partial demethanization of the oil in the absorber reduces the overhead gas from the rich-oil deethanizer, thereby reducing the lean-oil requirement at the latter column and eliminating need for a recompressor to inject excess fuel gas into the plant residue. An offsetting increase in oil rate at the absorber is required, but since more favorable equilibrium conditions for the key components are encountered at the absorber, recovery for a given total oil circulation is improved. A second advantage is that the rich-oil temperature level at the absorber bottom condition is low, permitting a better lean oil-rich oil temperature approach, and hence better thermal efficiency, than a cycle in which only the rich-oil deethanizer is reboiled by hot lean oil from the still.

Still

Oil from the deethanizer at 400° F. is then admitted to the still, a 4-ft.-diameter vessel containing 21 trays with 18-in. spacing. The oil is removed from the still by means of an internal accumulator three trays below the feed tray, pumped through a direct-fired heater, and returned to the accumulator at 510° F. Design stripping steam to the base of the still is 2,340 lb. per hour.

Still overhead gas is totally condensed at approximately 100 psig. and collected in the raw product accumulator, which serves also as a still reflux tank. Reflux rate to the still is controlled by the overhead temperature.

Caustic treating . . . These facilities were installed upstream to the depropanizer for reduction of mercaptan content and to insure trace hydrogen sulfide removal from all products. The contactor is 2½ ft. in diameter and contains 16 perforated trays spaced 2 ft. apart. A 10 per cent caustic solution, circulated at 7 g.p.m., serves as the continuous phase. Caustic from the contactor is heated by exchange and by means of a steam-heated feed preheater before entry to the regenerator on the top tray. The regenerator, also 2½ ft. in diameter, contains 20 trays and operates at essentially atmospheric pressure, utilizing 1,900 lb. per hour of stripping steam generated by flashing 50 lb. condensate.

Depropanization . . . After passing from the caustic contactor, the raw feed is water washed, passed through a coalescer for water removal, and admitted to the depropanizer. Flow through the fractionating system is conventional. The propane is dehydrated through dry-desiccant beds prior to storage and final sweetening of gasoline is by means of the solid copper chloride process. All products are stored aboveground in horizontal tanks with storage capacity equivalent to approximately 5 days' production. Vertical, motor-driven pumps located near the tanks and remotely controlled from the loading rack are used for loading products.

Dehydration . . . Absorber residue gas, after passing through an outlet scrubber, is dehydrated in a solid-desiccant bed and passed into a sales pipeline. Dehydration equipment consists of two 28-ft.-tall, 3-ft.-diameter columns conually operated.

How Drilling Contractor Can Promote Safety

By W. H. Moore

THE over-all frequency rate of all industries is 8.40 disabling injuries per 1 million man-hours. The petroleum industry, of which the drilling contractor is a part, has a frequency rate of 9.67. The drilling contractor's average frequency rate is at least 50 disabling injuries per 1 million man-hours. This is a conservative estimate taken from several major drilling contractors with very active safety programs. No actual facts are available because few contractors keep reliable records. This is, by far, the worst frequency rating of any major American industry. The nearest approach to this is the lumber industry with 35.48, then the mining and coal industry with 33.

The drilling contractor who has finally "gotten religion" about safety can do these things to remedy that figure:

1. See that careful step-by-step safety instructions are given to each employe.

2. Establish a good sound set of safety rules, and see that all supervisors set a good example by following the rules themselves.

3. Give all employes a thorough explanation of safety rules, including the reasons for them.

4. Give regular attention to safety and assign it a high priority in making departmental plans, and in selecting new equipment.

5. Investigate and take action on safety hazards so that accidents can be prevented.

6. Consistently enforce the proper use of safety equipment, guards, and other protective devices.

7. Do not sacrifice safety for any emergency.

8. Insist upon good-housekeeping practices at all times.

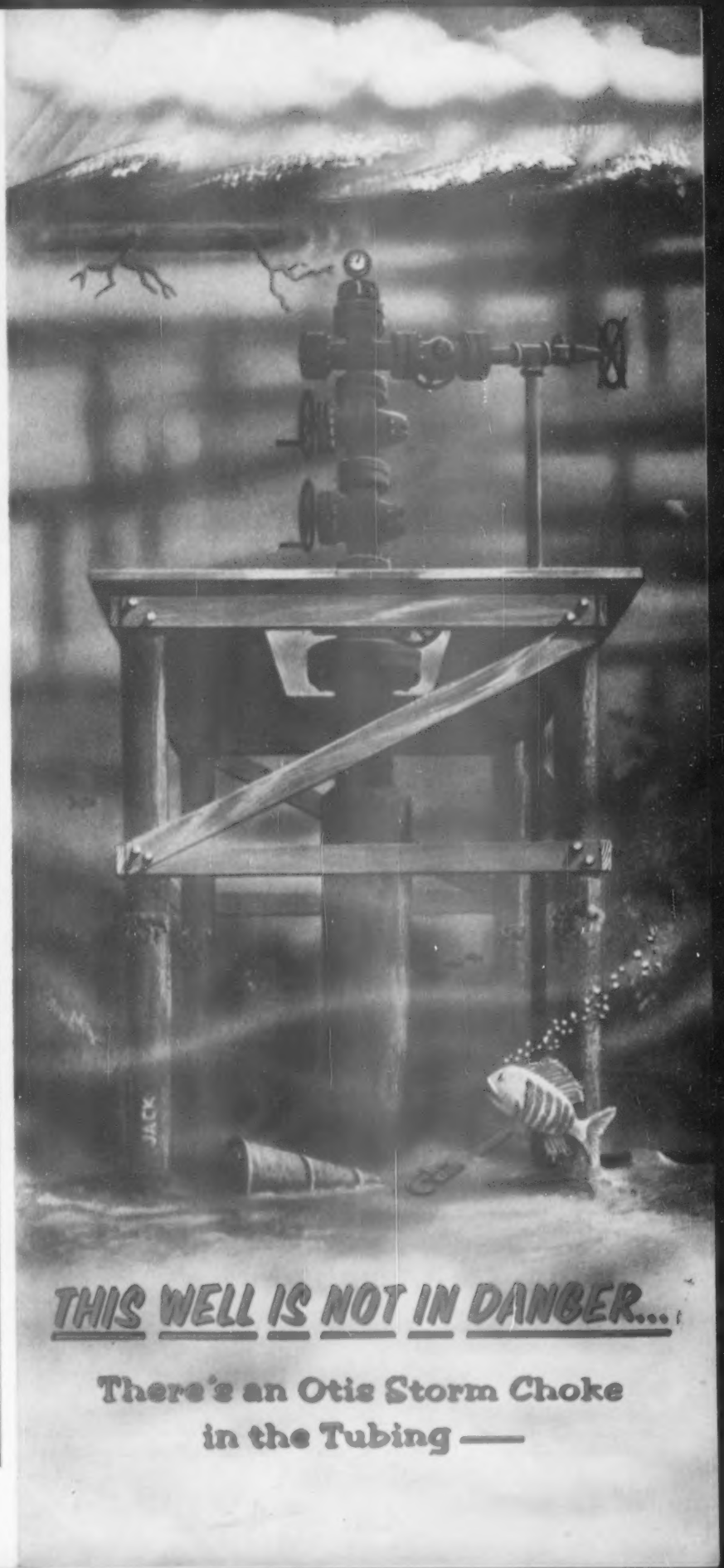
9. Base the accident-prevention program on a sincere interest in the health and safety of employes.

10. Personally attend enough safety meetings, and take an active part in the meeting to insure recognition of your sincere interest in the employe's safety and well being.

11. Put the heat on the oil-field equipment manufacturers for safer drilling equipment.

12. Leave no doubt in the minds of the safety engineer, drilling superintendent, tool pusher, driller, or the roughneck that you believe in, and demand their complete cooperation and assistance in the safety program.

Author is assistant general manager, Southern Production Co. From a paper presented at A.A.O.D.C. safety clinic, New Iberia, La.



The average wildcat costs much more than it should. The reason: lack of planning—a failure to coordinate the knowledge and efforts of the geologists, engineers, superintendents, and tool pushers involved. Realizing this, Humble Oil & Refining Co. has taken this new approach to wildcat well planning. For each wildcat...

...advance meetings such as this are held to decide...

Here's How Humble Cuts Wildcat Costs

THE cost of a rank wildcat well today may range anywhere from $100,000 to more than $1,000,000. Such exploratory wells in unproven territory have not always been so expensive, but they have involved too much financial risk to leave very many details to chance.

In an effort to bring to each exploratory well the best possible organization, planning, and procedure, Humble Oil & Refining Co. in the past 3 years has developed a "wildcat planning meeting." This meeting is an occasion where key personnel gather to plan the project. The meeting usually lasts from 2 to 3 hours and is designed to produce a complete understanding of methods and aims and to achieve the best results.

Who? . . . The people who take part in each wildcat planning meeting from the division office are: division geologist or his assistant, division production geologist, division superintendent or his assistant, division geophysicist or his assistant, and division petroleum engineer; from the district office: production geologist (he will sit on the well), production superintendent, petroleum engineer, and tool pusher in charge of the rig.

Before this group meets to lay out the final operational plan for the wildcat, the way has been paved by the efforts of a multitude of specialists over a period of years.

Maybe 10 years ago or more a surface geologist had found that outcroppings in the area to be drilled showed some promise. His report may have led to a more careful check of the area by gravity meter or by geophysics. In the ensuing years, some other company or individual may have drilled a wildcat somewhere in the area, and from that "dry hole" a scout added some information to the growing fund of knowledge. Perhaps a few samples from the unsuccessful venture came under the eyes of a division paleontologist.

Based on all of the information accumulated, an exploratory geologist recommended and received approval to lease acreage covering the formation. Landmen and lease men started blocking up the area, covering all acreage that appeared to be underlain by what looked like a favorable formation for containing oil or gas.

The group in the wildcat planning meeting uses all of this information as the basis for discussion and for decisions.

When? . . . After all of the foregoing operations have been completed and the desired acreage has been placed under lease, the division geologist requests that a wildcat test be drilled. When approved, the wildcat is budgeted. An approximate date is set for the venture, and the planning meeting is called. Date for the planning meeting usually is 2 to 3 weeks before actual clearing of drilling site and moving in of equipment starts.

Why? . . . Everyone who attends the planning meeting has a chance to become thoroughly acquainted with: land and lease situation of the prospect, including any unusual conditions; the geology of the prospect, including the promising formations the bit will seek to tap; and the potential hazards and unusual drilling conditions likely to be encountered. In short, the purpose of the meeting is to develop complete understanding and the teamwork needed to complete the project successfully.

What? . . . Specifically, what does the group discuss in the wildcat planning meeting? Based on the geologic information at hand, revealed by logs and maps, the actual drilling procedure is outlined. Agreement is reached on the size of rig needed to drill to the depth geologists want to explore; the size of hole to be drilled; where casing will be set; the number of cores to be taken and at what depths they should be cut; the number of drill-stem tests to be made; the type of mud or other drilling

Reprinted from The Humble Way, courtesy of the Humble Oil & Refining Co.

...the type of drilling mud to be used...

...the number of drill-stem tests to be made...

...the number of cores and their depths...

...the type and number of logs to be run...

fluids to be used; cementing plans; and the number and type of logs to be run. Preparation of site, moving in of equipment, and provision for water and fuel complete the planning.

The end result of such careful planning makes it possible for the production department to calculate the probable cost of a wildcat with a degree of accuracy that had never been possible before the planning meetings were started. Moreover, as one geologist put it, "full understanding of details about the project by both exploration and production department people brings about greater teamwork, a better knowledge of objectives, and a keener interest and enthusiasm for developing the wildcat test into a producing oil or gas well."

...and the size and amount of casing and drill pipe needed.

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Short Cuts for Finding Relative Permeabilities—1

by Dr. R. F. Nielsen

THERE are different ideas about the best way to measure relative permeabilities and to calculate them from capillary pressure-saturation curves. The present trend is toward faster and more convenient methods, if these give sufficient accuracy.

For calculating relative permeabilities from capillary-pressure curves, those[1,2,3,4] derived on the "bundle of parallel capillaries" idea have met with most success. The discrepancies have been in choice of a "tortuosity factor." The method of Burdine and a simplification of this due to Corey[5] will be used to illustrate.

High cost of steady-state methods of measurement has led to use of nonsteady-state methods. A method by Welge,[6] based on a Buckley-Leverett saturation distribution, will be used as illustration.

Example No. 1

Problem: From capillary pressure curve of Fig. 1, calculate oil and gas relative permeabilities by the Burdine method (no water present).

Solution: Replot the curve as $1/P^2$ (Fig. 2). To find relative permeabilities k_o and k_g at any oil saturation S, determine areas A_1 and A_2 in consistent units. A vertical line at saturation S in question separates the two areas. Then:

$$k_o = (x^2 A_1)/(A_1 + A_2)$$
$$k_g = (y^2 A_2)/(A_1 + A_2) \qquad (1)$$

To find x and y, we have to know the maximum oil saturation S_r at which k_o is zero, that is, the "residual" or "unrecoverable" oil. This is 0.25 from the capillary pressure curve (Figs. 1 and 2). We must also know minimum oil saturation S_m at which k_g is zero. For want of data, S_m may be taken as unity. Then:

$$x = \frac{S - S_r}{1 - S_r},$$

$$y = 1 - \frac{S - S_r}{S_m - S_r} \qquad (2)$$

If $S_m = 1$, $y = 1 - x$.

To calculate k_o and k_g at an oil saturation $S = 0.65$, the vertical line at $S = 0.65$ divides A_1 from A_2. The areas are 43 and 104, respectively. $S_r = 0.25$, and $S_m = 1$. Hence $x = (0.65 - 0.25)/(1 - 0.25) = 0.533$, $x^2 = 0.283$, $y = 1 - x = 0.467$, $y^2 = 0.218$. Then:

$$k_o = 0.283 \times 43/147 = 0.083, \text{ and}$$

$$k_g = 0.218 \times 104/147 = 0.154$$

The calculation is repeated for a series of saturations to obtain relative permeability-saturation curves. The expression for k_g is not valid for values of S near or below S_r.

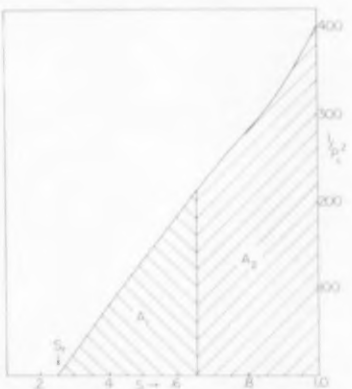

Fig. 1—Capillary pressure as a function of oil saturation.

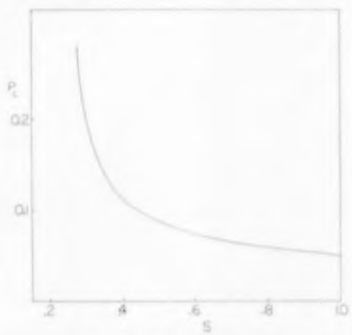

Fig. 2—Plot of $1/P_c^2$ as a function of oil saturation.

For oil-water relative permeabilities, the expression for k_o and k_g correspond to the wetting and nonwetting phases respectively. S_m must be known by experiment or approximated by the relation $S_m = S_r (1 - S_r)$.

Example No. 2

Problem: Taking $S_r = 0.25$, find oil and gas relative permeabilities at an oil saturation $S = 0.65$ by the Corey method.

Solution: Simplification due to Corey observes that the plot of $1/P^2$ may usually be approximated by a straight line. Then $A_1/(A_1 + A_2) = x^2$ and:

$$k_o = x^4 \qquad (3)$$

by geometry and Equation 2 (see Fig. 2). Also $A_2/(A_1 + A_2) = 1 - x^2$, so:

$$k_g = y^2 (1 - x^2) \qquad (4)$$

If $S_m = 1$, $y = 1 - x$, and:

$$k_g = (1 - x)^2 (1 - x^2) \qquad (5)$$

If $S_r = 0.25$ and $S = 0.65$, $x = 0.533$ from previous calculation. Then by Equation 3, $k_o = 0.533^4 = 0.083$. If $S_m = 1$, $k_g = (1 - 0.533)^2 (1 - 0.533^2) = 0.467^2 \times 0.717 = 0.156$. Agreement with the Burdine method is expected, since the $1/P^2$ plot is linear.

Since gas relative permeabilities may be run rapidly by the "stationary liquid method," Corey suggested using Equation 5 to find x as a function of S from measured k_g values. Denoting such values of x by x', when $x' = 0$, $S = S_r$, and when $x' = 1$, $S = S_m$. Taking value of S_r so obtained, k_o is calculated by the relation $k_o = x^4$, where x is defined as in Equation 2.

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Author is associate professor of petroleum and natural-gas engineering, Pennsylvania State University.

by R. I. Martin

ELECTRIC LOGGING—53

How Induction Logs Work

IF a well is drilled using oilbase mud, the resistivity of the mud column is so high that normal current flow is prevented. A similar situation occurs in wells drilled with low fluid levels, such as cable-tool holes. The hole above the fluid level cannot be logged. In order to complete the circuit, scratcher-type electrodes have been used. These are forced against the wall of the hole to provide direct contact with the formation. Because the results obtained were not too satisfactory, alternative methods were considered.

The induction log has been developed for use in such cases where a complete circuit it unobtainable.

Fig. 1 shows the first device used. An alternating current of approximately 20,000 cycles per second is passed through a transmitter coil T. This sets up an alternating electromagnetic field which causes eddy currents in the surrounding formation. These eddy currents flow in circular paths coaxial with the instrument and the bore hole. Just as the transmitter coil sets up an alternating electromagnetic field, so will the eddy currents within the formation set up their own secondary electromagnetic field. This secondary magnetic field induces an electromotive force in the receiver coil. The current flowing in the receiver coil is rectified, amplified, and transmitted to the surface.

If the current flowing in the transmitter coil is maintained at a constant value, the intensity of the eddy currents set up in the formation will be proportional to the conductivity of the formations. That is, it will be inversely proportional to the resistivity. Hence, the current found flowing in the receiver coil constitutes a measure of the conductivity.

An induction log is compared with a conventional log in Fig. 2. The conductivity scale is linear, while the resistivity scale is a reciprocal scale. As a result, the induction log has a different appearance. High resistivity values are compressed while low values are exaggerated. For example, a change from 5 ohm-m to infinity takes place in less horizontal distance than a change from 2 to 3 ohm-m.

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This feature offers certain advantages. The log is not complicated by off-scale values and repeats at high resistivity values. At the same time, low resistivity shale sections show considerable detail which is often useful for correlation.

There are also disadvantages. It is difficult in a lot of cases to relate the log to the scale of resistivity. If beds of high resistivity (about 50 ohm-m) are present at frequent intervals, they may be used to fix the infinity line. Values such as these will give very flat-topped peaks so that they may be recognized readily. When this is the case, it is often found that the infinity line changes with depth. That is, there is a drift in the instrument.

When high-resistivity beds are not present, or occur only in the upper part of the well, it may be possible to refer to the shale resistivities. This is not easy in practice and small errors become magnified. For example, in Fig. 2, if an error of half an ohm-m is made in assigning a value to the shale beds, then an error of from 5 to 10 ohm-m, or from 10 ohm-m to infinity, will be introduced at the high resistivity end of the scale.

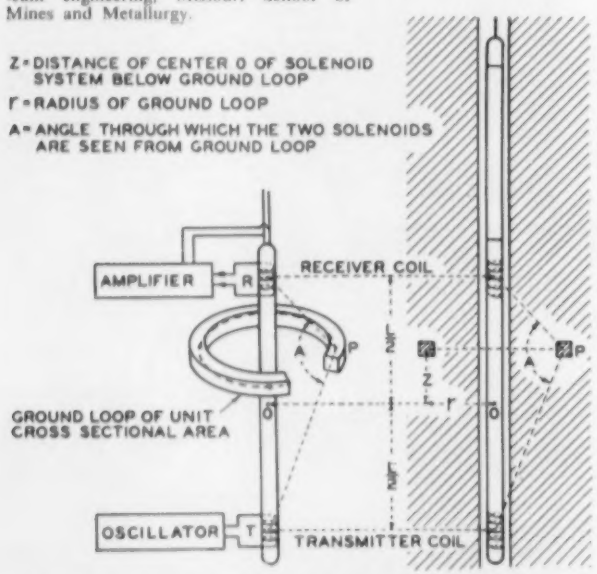

Fig. 1—The device used for induction logging. An alternating current of about 20,000 cycles per second passes through transmitter coil T. Both figures from Doll, A.I.M.E., June 1949, T.P. 2641.

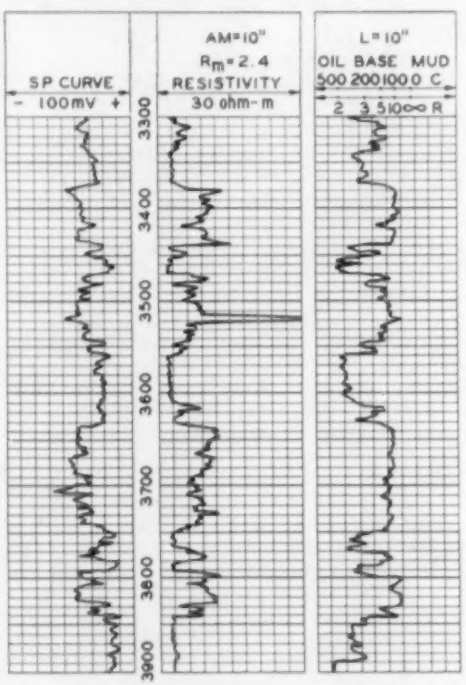

Fig. 2—Field case of an induction log compared with a conventional log. It is often difficult to relate the log to the scale of resistivity.

COBALT BROMIDE TEST—1

Water Solubility in Liquid Propane

by R. M. Gentry and V. H. Gunther

- What is the effect of volume, temperature, and propylene content of the sample on the sensitivity of the N.G.A.A. cobalt bromide test for moisture in commercial propane?

- The N.G.A.A. procedure specifies approximately 15 gal. of sample, but it appears possible to lower this requirement to 3 gal.

- Lowering the temperature of the sample during the test increases the sensitivity, but the presence of propylene results in a loss of sensitivity.

Test . . . The cobalt bromide test for detection of water in commercial propane is the recognized standard of the N.G.A.A.[3] This method depends on the observation that propane vapor in equilibrium with liquid propane at a given temperature will contain a concentration of water vapor in direct proportion to the concentration of water in the liquid propane. Use is made of the fact that cobalt bromide may be used as a moisture indicator since it changes color with changing humidity of the surrounding gas. Propane from the vapor phase of the sample is passed over finely divided cobalt bromide supported on a cotton plug and the sample is judged to be wet or dry depending on the final color of the salt.

Factors . . . Three important factors which appreciably affect the test are the volume, temperature, and propylene content of the sample. The current N.G.A. procedure specifies approximately 15 gal. of sample, but a sample of this size is inconvenient, particularly when frequent testing is required. However, by lowering the temperature of the sample below the ambient, it was found possible to get a sensitive test with only 3 gal.

The N.G.A.A. procedure does not specify the temperature of the sample at the time of the test, although it is well known[1,2] that the distribution of water between the gas and liquid phases of the propane will vary appreciably with temperature.

(Continued on next page)

Authors are with Shell Oil Co. at Wood River, Ill. Paper presented at the Symposium on Methods for Testing L.P.G., St. Louis, September 27-28, 1954.

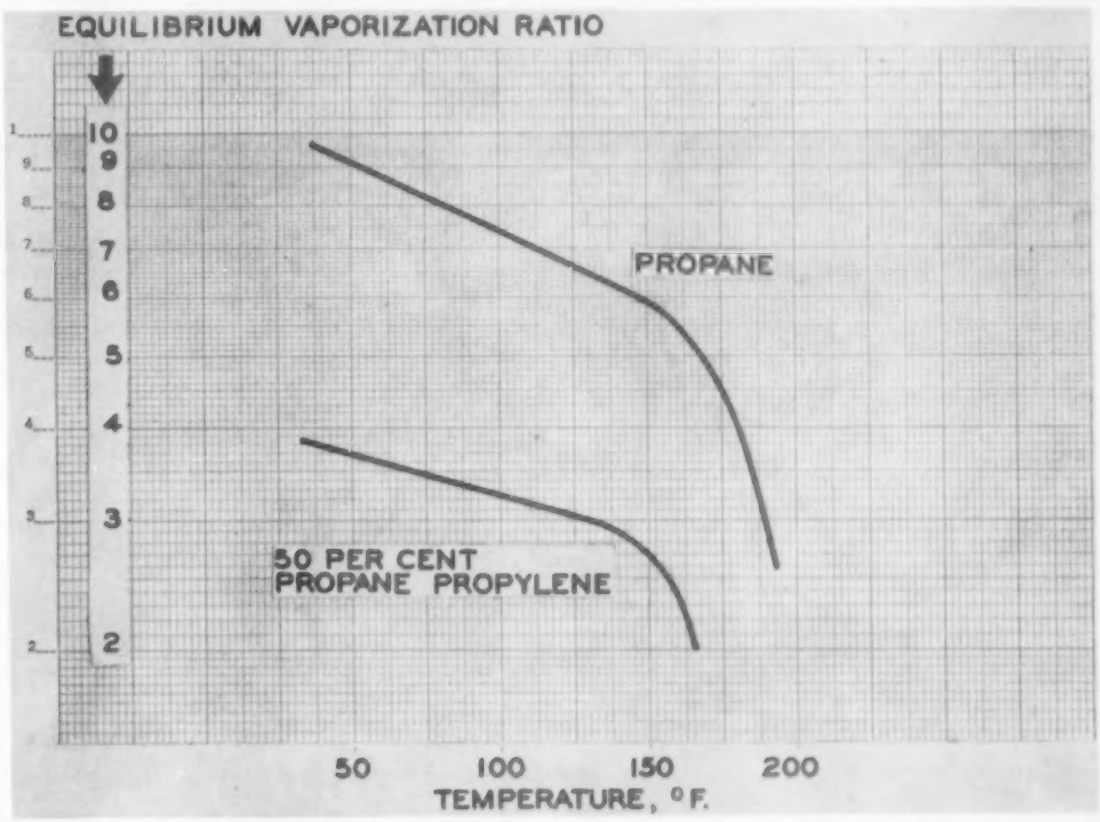

FIG. 1—Equilibrium vaporization ratios for water in propane and propane propylene.

Although the N.G.A.A. method is applicable by definition to commercial propane containing up to 95 per cent propylene, it has been found that test results are affected by the propylene content of the sample.

Temperature . . . A plot of data for solubility of water in liquid propane in the range of 60°-187° F. as observed by Poettmann and Dean[2] is given in Fig. 2. Also given is a plot of the calculated water content of the saturated vapor in equilibrium with water-saturated liquid propane. Using these data, the equilibrium vaporization ratios for water in this system have been calculated at several temperatures. The results are plotted in Fig. 1.

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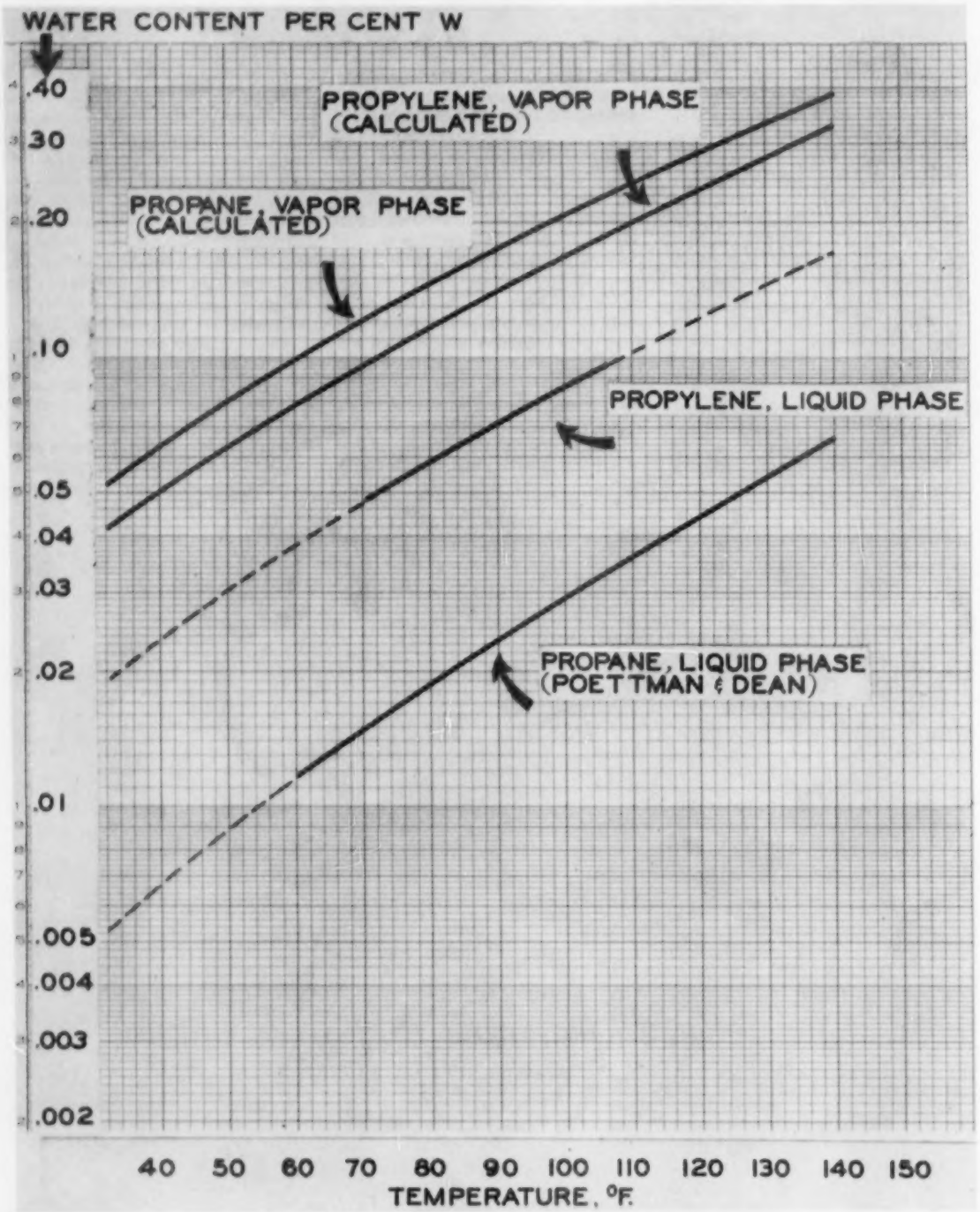
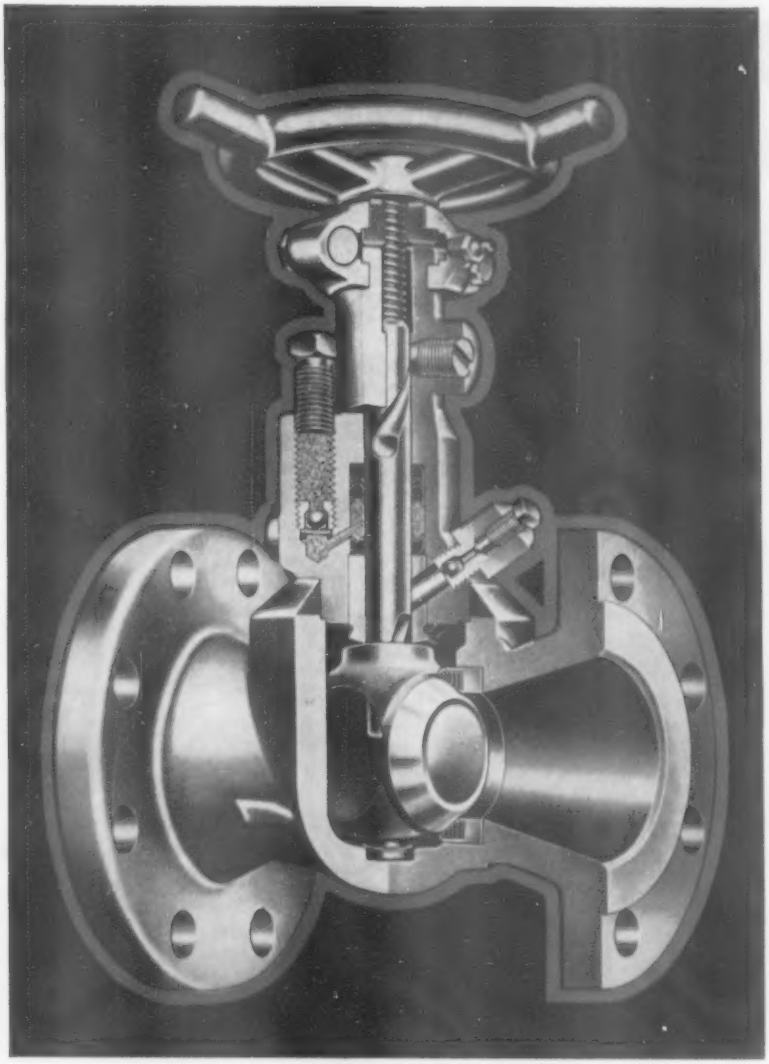


FIG. 2—Water content of saturated propane and propylene liquids and vapors.



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400 Lb.	4", 6"	2500 Lb.	2½", 3", 4"
600 Lb.	2", 2½", 3", 4", 6"		

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400 Lb.	4"	1500 Lb.	1", 2", 2½", 3"
600 Lb.	1", 1½", 2", 2½", 3", 4"	2500 Lb.	1", 2", 2½", 3"

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by W. L. Nelson
Technical Editor

QUESTIONS ON TECHNOLOGY

How Much Does Refrigeration Cost?

"What is the cost of a ton of refrigeration? Your Petroleum Refinery Engineering shows $0.46 to $3.16 for 1932. Are such figures still representative?—Wm. G. S.

The 1932 costs are in line although situations in which the high cost would occur are rare. The major costs of refrigeration are (1) power and (2) depreciation and maintenance—and of course, the low temperature that is to be attained affects the power requirement.

For ammonia-type refrigeration systems, the power requirements, when the condenser is supplied with 4 g.p.m. of 85° F. water, are somewhat as shown in Table 1.

TABLE 1—BRAKE HORSEPOWER PER TON OF REFRIGERATION

Temp. (°F.)	Single-stage	Two-stage
50	0.685	
40	0.83	
30	0.96	
20	1.21	1.05
10	1.41	1.23
0	1.76	1.40
—10	2.15	1.75
—20	2.50	2.00
—30	2.85	2.20
—40	4.40	3.34
—50	5.30	4.00
—60	5.85	4.75
—70		5.55
—80		6.10
—90		7.25
—100		10.90

The cost of refrigeration equipment can be found in Cost-imating No. 38, "Refrigeration Plants," The Oil and Gas Journal, July 7, 1949, page 38, and these costs as of 1946 can be converted to 1953 by the Nelson Construction Cost Index which appears each month in the first weekly issue of The Oil and Gas Journal.

The operation costs shown in Table 2 are based on a power cost of 1-cent per kw., water at 2 cents per 1,000 gal., depreciation in 20 years, maintenance as half of the depreciation, and the use of three to six men per day depending on the size of the installation.

Viscosity of Crude Oils

"Can you tell us how the viscosity of Mid-Continent crude oils changes with temperature and some other oils, too, for comparison? G. Wm. P.

The viscosity-temperature lines for about 50 Mid-Continent crude oils were published on the January 5 and January 12, 1946, issues of this page, and in addition, average lines for crude oils were published in the November 15, 1954, issue. However, as a comparison of all types of crude oils, see Fig. 1 on this page which shows lines for the wide variety of important oils shown above. The lines must be be used with caution below temperatures of 70° or 80° F., because if freezing of wax occurs, the viscosity rises sharply. This is probably what happened when the 36.4° Salt Creek, Wyoming, oil was tested.

A.P.I.	
16.0	Baxterville, Miss.
19.8	Placerita, Calif.
21.0	East Eucutta, Miss.
22.2	Heidelberg, Miss.
24.0	South Mountain, Calif.
24.4	Talco, Tex.
24.6	Torrance, Calif.
32.0	Oklahoma (typical)
32.2	Kettleman Hills, Calif.
33.0	West Texas
36.4	Salt Creek, Wyo.
38.5	Illinois
39.0	North Texas
40.1	East Texas
42.0	Pennsylvania pipeline
44.0	Oklahoma (typical)
16.2	Lloydminster, Canada
27.9	Haradh, Saudi Arabia
38.6	Qatif, Saudi Arabia
10.6	Lagunillas Tar, Venezuela
13.5	Bachaquero, Venezuela
14.7	Tia Juana, Venezuela
18.0	Lagunillas, Venezuela
18.3	Quiriquire, Venezuela
26.0	Tia Juana, Venezuela
27.0	Oficina (heavy), Venezuela
31.9	Jusepin, Venezuela
39.2	San Joaquin, Venezuela
43.1	Santa Rosa, Venezuela

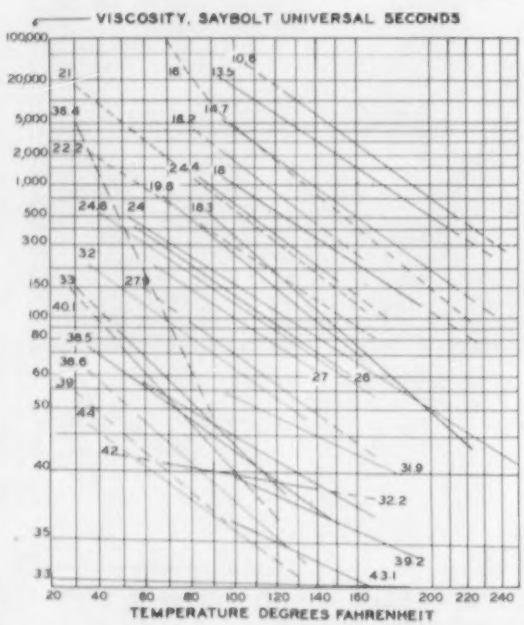

Fig. 1—Viscosity-temperature lines, standard A.S.T.M. chart, for a wide variety of crude oils.

TABLE 2—APPROXIMATE COST OF AMMONIA REFRIGERATION
(Cents per ton of refrigeration*)

	150-ton plant			500-ton plant			1,000-ton plant			1,500-ton plant		
	Zero	—40° F.	—80° F.	Zero	—40° F.	—80° F.	Zero	—40° F.	—80° F.	Zero	—40° F.	—80° F.
Power	†42.2	†105.0	146.0	33.6	80.5	146.0	33.6	80.5	146.0	33.6	80.5	146.0
Water	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5
Depreciation	15.2	30.4	71.5	11.5	27.6	43.2	11.5	27.6	43.2	11.5	27.6	43.2
Maintenance	7.6	15.2	21.6	5.2	13.8	21.6	5.2	13.8	21.6	5.2	13.8	21.6
Labor	32.0	32.0	32.0	12.8	12.8	12.8	8.0	8.0	8.0	6.4	6.4	6.4
Supervision	2.0	2.0	2.0	1.3	1.3	1.3	0.8	0.8	0.8	0.8	0.8	0.8
Total	110.5	196.1	284.6	75.9	147.5	236.4	70.6	142.2	231.1	69.0	140.6	229.5

*One ton of ice produced in 24 hours from and at 0° F., or 288,000 B.t.u. per 24 hours. †Single-stage compressors—all others two-stage.

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3. The combustion gases, at the top of the heater, are diverted towards the walls where they recirculate from the top of the heater downward, behind and between the tubes, increasing the heat input to the rear of the heating elements by convection;

4. The recirculated gases reduce the heat intensity at the bottom of the furnace so that the heat input is the same, top and bottom.

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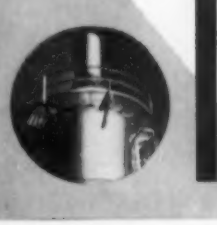

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Aftercooling and Condensate Knockout

by R. L. Dockendorff

AT Air Station No. 2 . . . Here three relatively modern synchronous-motor-driven compressors team up with two gas-engine-driven compressors to compress a total of 9,200 standard cu. ft. per minute of air to 110 psig., 6,600 from motor-driven and 2,600 from engine-driven units. The combined output is cooled to 100°-110° F. (summer conditions) before passing through a condensate knock-out drum.

Instrument air removed from the total stream at this point was originally 1,200 standard cu. ft. per minuate maximum; this has now been increased to over 1,900, as compared to a nominal capacity of about 2,600 standard cu. ft. per minute. Power supply for the motors is from a single feeder, separate from the two serving Air Station No. 1, so that practically the entire refinery instrument-air load is protected from either power failure or gas-engine down time.

Aftercooling . . . High-pressure air diverted to the instrument-air system at each station is processed in equipment substantially identical, except for size. At Air Station No. 2, the air is further cooled for maximum water knockout with an additional aftercooler. The significance of this step is shown in Fig. 4.

Cooling the air an additional 10° F. in the vicinity of 100° F. and 100 psig. can increase the capacity of a drying bed by 30 to 40 per cent. With cooling water generally available in the Gulf Coast area at a maximum of 70°-90° F., it can become very costly to reduce the air temperature much below 95°-100° F. Here, then, is the place to calculate an economic optimum. Since it is important to prevent condensation at all times of the year rather than winter-time freezing alone, the design must provide capacity for summer-time operation, although dryness requirements may be relaxed considerably.

Author is with the engineering division, Humble Oil & Refining Co. at Baytown, Tex. Paper presented at the Texas A. & M. process instrumentation symposium at College Station, Tex., January 25-28, 1955.

Refrigeration . . . Another feature of this calculation is the use of refrigeration to further reduce the air temperature and its saturation moisture content. Of course, refrigeration is expensive, too, but in some cases it is optimum to remove the bulk of the water by such forecooling, and to trim to a low final water content with a desiccant bed.

For example, we at Baytown found several years ago that to obtain dry air at 35 psig. it is optimum to refrigerate to about 50° F. In this way we obtained about 80 per cent removal of the water of saturation at 100° F. and 35 psig., with the final 20 per cent removed in a desiccant-type unit. At a pressure of 100 psig. the saturation water is about one-third as great as at 35 psig., so there is less incentive to combine the two types of water-removal equipment.

Condensate Knockout

Liberally sized water-knockout drums are in use at both air stations. However, there is some evidence that these and other knockout drums following air aftercoolers probably should be proved with mist eliminators, such as crinkled-wire-mesh pads.

Although an appreciable part of the condensate produced in the aftercooler is formed at the tube wall and will agglomerate and flow as liquid into the separator, the conditions also permit the formation of a mist or fog in the main air stream, only part of which at best can be removed even with a mist extractor.

A fog is formed by the condensation of fine droplets of liquid out of a saturated vapor system when the cooling is by mixing with another cooler, saturated vapor stream. Over a wide range of proportions, such a mixture will be below its dew point (incipient condensation temperature). Thus if nuclei are available (such as dust particles) or if the system is mechanically disturbed (as by turbulence within an exchanger), condensation into suspended liquid droplets can occur.

Unless this fog is largely dissipated, the mosture to be removed in subsequent dryers will considerably exceed the amount calculable at saturation. Drum-sizing criteria are well known to designers, and manufacturers are able to supply information on mist extractors.

Dryers

The drying step proper is probably the feature of greatest interest. Numerous drying agents may be considered. Their acceptability depends upon dryness required, transmission pressure, size of system, utilities for regeneration, and cost for initial and replacement charges, among other factors. A rather thorough listing of desiccants may be found in the literature.[2,4]

References

2. Amero, Moore, and Capell; C.E.P., 43:349 (1947).

4. Campbell, Skinner, and Lawrence; Pet. Ref. 31-10:106 (1952).

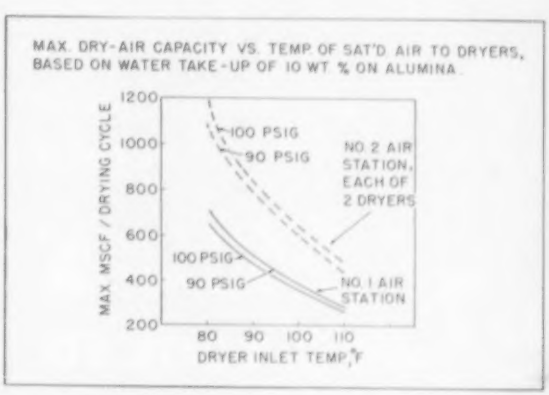
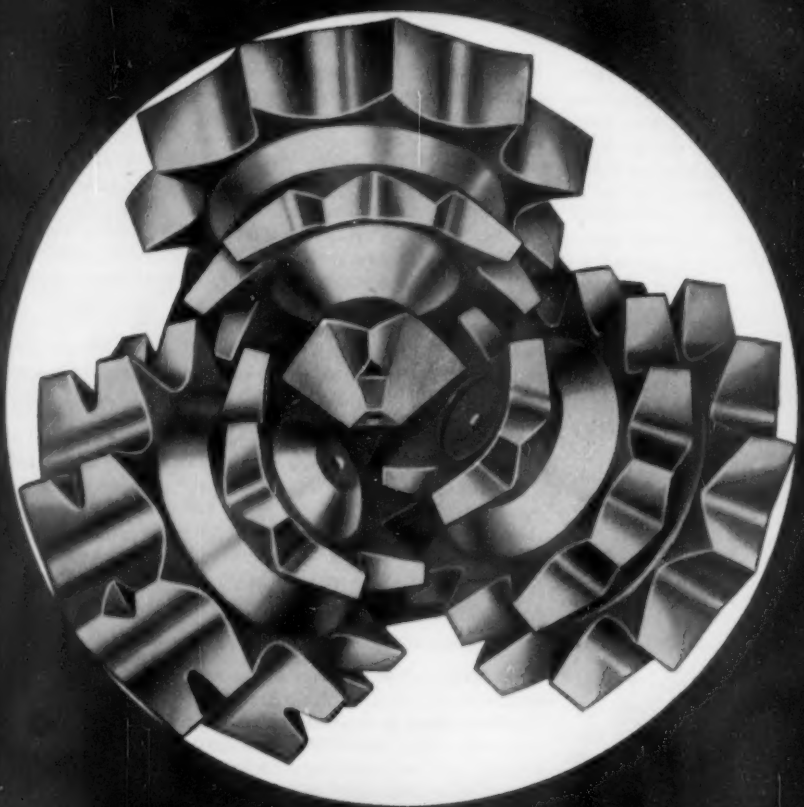


Fig. 4

H C Smith 3-CUTTER ROCK BITS



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Among the

Drilling Contractors

Tandem Drilling Co., Camden, Ark., has a new contract operation under way on the north edge of Horsehead field, in Columbia County, southern Arkansas. It is for A. M. Jackson, of Shreveport, at 1 Foster-Grayson, in 14-19s-21w, a projected 6,000-ft. test.

C. A. Clark, Protem, Mo., has the contract for a shallow wildcat test northeast of Maumee, 10 miles north of Marshall, in northern Searcy County, in the north central part of Arkansas. It will be a 1,500-ft. cable-tool job for Fred E. Allen, of Mountain Home, Ark.

Head & Welsh, Corpus Christi, will drill a 3,500-ft. wildcat test for Coastal Trend Oil & Gas Co. at 1 Yeager, in Morris & Cummings Survey 103, 5 miles west of Hebronville, in northwestern Jim Hogg County, near the Webb county line, in Southwest Texas.

R. W. Rine Drilling Co., Wichita, Kans., is drilling on another wildcat test United Producing Co. is putting down in far southwestern Kansas. The test is at 1 Shaffer, in 32-25s-39w, 12 miles southeast of Syracuse, in Hamilton County. Location is 1½ miles west of the Hugoton gas area. Hole will be carried to the Mississippian.

Baker-Taylor Drilling Co., Amarillo, Tex., is drilling a southwest offset test to Cabot Carbon Co.'s recently completed lower Missouri oil-discovery well 2 miles northwest of Morrow and Mississippian gas production in Mocane field, in Beaver County, Oklahoma Panhandle. The new test, 1 Judy, also for Cabot, is contracted to 5,400 ft.

"Throw up your hands and gimme your money."

J. M. Thomson is drilling for Argo Oil Co. at 1 Petrie, a new wildcat operation in Washington County, northeastern Colorado. Location is in 10-2n-49w, 6 miles northwest of Yuma.

Cimarron - Western Drilling Co., Tulsa, has a new wildcat operation under contract for Ryan-Davis Oil Co. in Adams County, Colorado. It is at 1 UPRR-Jolly, in 9-3s-58w, 7 miles southwest of South Badger Creek field.

American Tidelands, Inc., New Orleans, is under contract to Humble Oil & Refining Co. for a 12,000-ft. test to be drilled 25 miles offshore in the Gulf of Mexico from St. Mary Parish, Louisiana. Location is in Block 77, Eugene Island area.

Arrow Drilling Co., Dallas, has the contract for a Lower Cretaceous well Skelly Oil Co. will drill in Mississippi's active Soso field. It will be Skelly's first operation in that field. Arrow has had a rig working in the field for Union Producing Co. Skelly's well will be 1 Gambrell, located in 28-10n-13w, in the Jones County sector of the deep development. Productive zone is at 12,000 ft.

Cooper-Herring Drilling Co. is contractor on a new Woodbine wildcat test Byrd Oil Corp., of Dallas, and Hunt Oil Co., of Tyler, Tex., are starting in Anderson County, East Texas. Location is at 1 Dosser, in the J. D. Ransom Survey, 4 miles east of Montalba. Contract is for 5,500 ft.

Warren & Burdette Drilling Co., Houston, is to drill a 10,000-ft. wildcat test for Tamborello & Rasberry in the Maxie area, Acadia Parish, southern Louisiana. It will be at 1 Miller, in 42-8s-1w.

Adkins Drilling Co., San Antonio, is scheduled for a 6,000-ft. wildcat test to be drilled for Gulf Coast Leaseholds, Inc., of Houston, about 9 miles north of Nixon, in Gonzales County, Southwest Texas.

Brinkerhoff Drilling Co., Casper, Wyo., has contracted for a 13,500-ft. test to be put down for Stanolind Oil & Gas Co. in the Hans Creek area, 10

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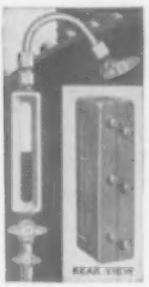

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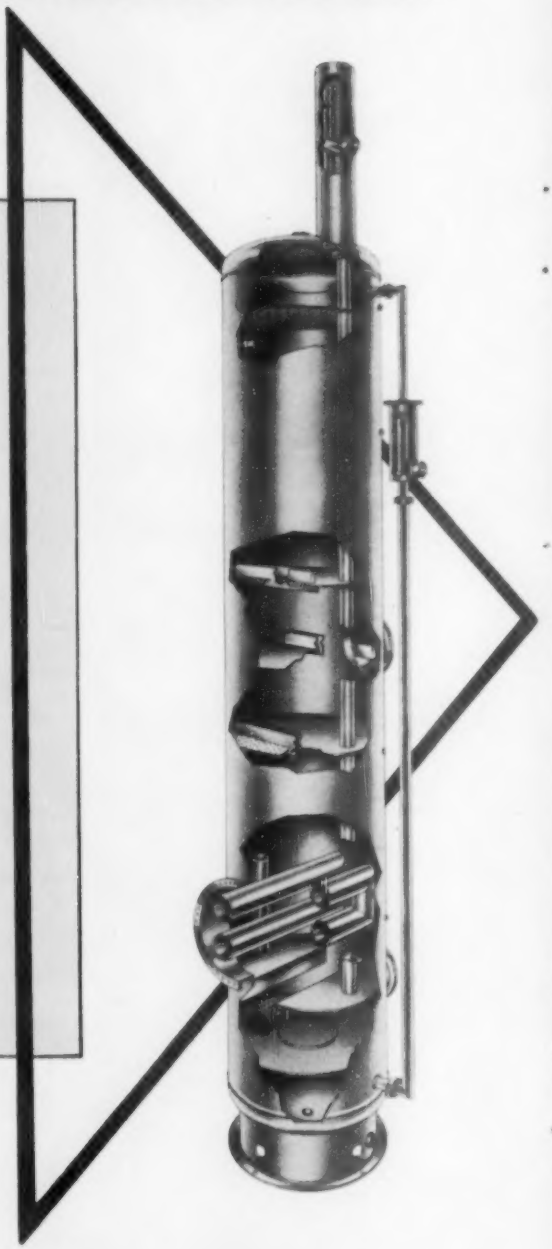

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miles northeast of Halliday, in Dunn County, North Dakota. The test is at 1 Benson, in 11-146n-91w. Stanolind expects to reach granite.

Bassett-Marchman Drilling Co., Vandalia, Ill., is a new drilling firm in the Illinois basin area. Principal owners are Clyde Bassett and Grady Marchman. The firm is starting with a T-8 National rig.

M & M Drilling Co. is contractor on a 10,600-ft. wildcat test F. A. Callery, Inc., of Houston, is undertaking 2¾ miles southeast of Alliance field, 20 miles down the Mississippi River from New Orleans, in Plaquemines Parish, Coastal Louisiana. Location is listed as 1 Louisiana Citrus Lands, in 10-17s-25e.

B. L. McFarland, Inc., Midland, Tex., has a new wildcat test under way for Texas Crude Oil Co. in southeastern Chaves County, southeastern New Mexico. Location is for 1-16 State, in 16-14-30, about 4½ miles west of Drickey field. Hole will be carried to 11,500 ft.

Como Drilling Co. has contracts for two more Tuscaloosa wells Union Producing Co. has scheduled for the old Tinsley field, in Yazoo County, Mississippi. First will be 36 Stevens, in 12-10n-3w. The other will be No. 37, in Section 1. Pay is at 5,400 ft.

Cook Drilling Co., Fort Worth, will drill Stanolind Oil & Gas Co.'s newly projected Smackover test on the northeast edge of Colquitt field, in Claiborne Parish, North Louisiana. Location is for 1 Ward-Sale Unit, in 26-23n-6w. Objective is near 10,700 ft.

Lewis Drilling Co., Denver, has contracted for a wildcat test to be drilled for Bruce Sullivan at 1 Reimenschneider, in 2-5s-52w, 10 miles southwest of the Rush Willadel area, in Washington County, northeastern Colorado.

Bateman Drilling Co., New Orleans, is under contract to Freeport Sulphur Co. for a 10,000-ft. wildcat test 2 miles south of Westwego field, southwest of New Orleans, in Jefferson Parish, Louisiana. Location is for 1 Marrero, in 12-14s-23e.

Blanton Drilling Co., Houston, has a new wildcat operation under way in Colorado County, South Texas. It is a contract job for Russell Maguire, of Wichita Falls, Tex., at 1 Hatterman, in the Alfred Kelso Survey. Location is 5½ miles southeast of Weimer, and about 2 miles north of Hamel field. The test is set up to go to 9,800 ft.

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...and power shovels move in to do the heavy digging.

Then air jacks clean around the pipe...

...and the old coating is removed before welding.

Here's how N.G.P.L. handled a preventive maintenance job of...

Fitting sleeves on old bolted couplings

FITTING sleeves to old Dressers is no dressmaker's job for maintenance men of Natural Gas Pipeline Co. of America. To them it means welding steel covers around old bolted couplings on N.G.P.L.'s Texas-Chicago line. It's just practical pipeline use of that ancient "ounce-of-prevention" adage.

The sleeves were installed recently on sections of the line where leaks were likely to appear. Besides the obvious leak-preventing value, the sleeves will also give an extra measure of protection against blowouts to homes located very near the right-of-way.

The work was done a few miles west of the Joliet meter station on the original 24-in. N.G.P.L. line. This particular section of line lies in the front yard of several farm homes. It was built before development of the stovepipe welding method and is joined with Dresser couplings every 80 ft. These couplings, as they age, have been found to be weak spots as far as leaks are concerned.

Managements of the operations and the pipeline division decided that reinforcing the couplings with welded sleeves would prevent trouble before it occurred. To do the job, pipeline maintenance crews were called in from all parts of the N.G.P.L. system and also from the Texas Illinois Natural Gas Pipeline Co. A total of 35 men worked on the project under the supervision

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The half-section goes on . . .

. . . and is fitted snugly by a hoist.

Then the sleeve is welded . . .

. . . and new coating added.

of H. E. Boomer, district superintendent of pipelines. In one 2½ mile section, 171 couplings were reinforced with welded sleeves.

Locating the couplings . . . Before the couplings could be reinforced, they had to be found. A crew using an electronic line finder and a surveyor's chain spotted the joints and staked their locations. The couplings were located with ease and accuracy with the electronic instrument.

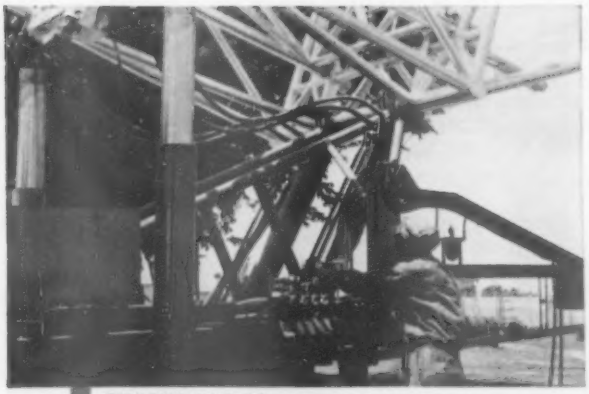
After all locations were staked, the power shovel followed to uncover the couplings. Digging holes just big enough for the welders to work in, they soon had the couplings exposed except for that soil under the pipe.

Next came a crew with air hammers and shovels to crumb out dirt under the pipe which the power shovels couldn't reach. In some places the clay was almost like rock and air hammers were needed. In other locations there actually was rock and other methods had to be used.

Rock blasting . . . When the line was originally built, it was laid flat on solid rock in some places and in a solid-rock trench in other locations. Now, when it came time to repair, there was no way to get under the pipe to weld sleeves. Blasting a work space under the pipe was the only answer.

An expert on explosives was called in to help decide about the type of explosive and locations of the charges. A blaster with 40 years' experience was also called in to help with the job. Small charges of dynamite were carefully set to jar the rock loose so it could be removed, leaving the pipeline undamaged.

After the holes were cleaned out and the old coating chipped from the pipe, the sleeves were fitted by members of the maintenance crews.



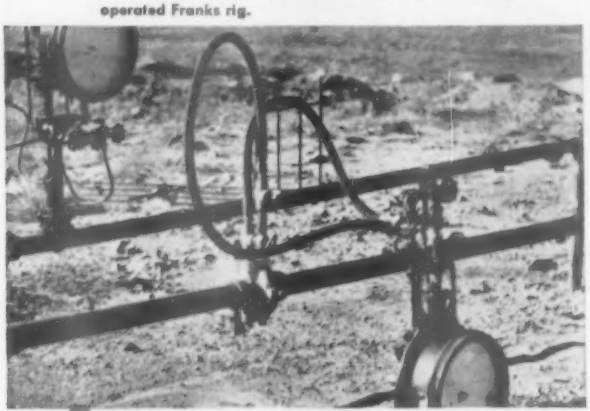
ON DRILLING RIGS—Aeroquip 1503 wire braid hose assures minimum downtime for this hydraulically operated Franks rig.

A SMALL SUPPLY OF AEROQUIP FLEXIBLE HOSE AND FITTINGS ASSURE

QUICK Field Replacement of All Fluid Lines

Get equipment back on the job FAST by making fluid line replacements the Aeroquip way. With a small, portable supply of bulk hose and reusable fittings, complete hose assemblies can be made right in the field. Just cut the hose to length and attach the fittings. Only ordinary tools are needed.

Aeroquip offers a complete line of high, medium and low pressure hose and matching fittings to meet every oil field need. It pays to standardize on Aeroquip. See your supply store, or write us for complete information.



ON CONTROLS, INSTRUMENTS—Aeroquip weather-resistant hose replaced copper tubing on this orifice meter to re-pressuring well.

ON ENGINES—Aeroquip one-piece *SOCKETLESS* fittings and 1525 hose solve fuel, oil, water and air line problems.

Aeroquip

REG. TRADE MARK

AEROQUIP CORPORATION, JACKSON, MICHIGAN

LOCAL REPRESENTATIVES IN PRINCIPAL CITIES IN U.S.A. AND ABROAD • AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

ANOTHER SHIPMENT of properly packed oil equipment leaves Tulsa Crating Company. 35 years experience has given us specialized knowledge in the most effective ways to protect shipments from breakage, exposure, pilferage, rough handling and other shipping dangers. No matter how big, or how small, every packaging job at Tulsa Crating is Precision Engineered to assure its arrival in perfect condition. And if you have export shipping headaches, we can cure them. We offer export counseling concerning customs regulations throughout the world to our clients without obligation. So, if you have any crating problems, domestic or export, call Tulsa Crating Co., 519 S. Rockford, Tulsa, Okla. Phone 3-6482 or 3-3492. Adv.

Pipeline Patrol

Welders moved in right behind the fitters and welded the sleeves in place.

Following the welding, all sleeves were coated with hot coal tar and wrapped with felt. Last came the backfill crew to fill the holes, clean up the right-of-way, and repair the fences. The resulting line is, for all intents, like a new, all-welded line. Courtesy of Between The Lines.

Here are specs on the newest pipelayer

THE latest in pipeline construction equipment is a 39-ton sideboom tractor which handles big-inch pipe with ease. It had its first full-scale field tests in December of last year. R. H. Fulton & Co. tested the big tractor in laying 24 miles of 30-in. line in Kansas for Panhandle Eastern Pipe Line Co.

Designated No. 583 by its maker, Caterpillar Tractor Co., the big machine was tested first on lowering-in work. That work was being done by

PIPELINE KETTLES
YARD PIPE RECONDITIONING EQUIPMENT
PORTABLE GENERATORS
CUTTING & BEVELING MACHINES
CLEANING & PRIMING MACHINES
PORTABLE BUFFING UNITS
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ENDLESS PIPE BELT SLINGS
VERSATILE
CROSE-LITTLEFORD
MODEL 211-10 P2
PIPELINE COATING KETTLE
For transporting on highway.
For tough pipeline terrain.
10 Barrel capacity, complete with hydraulically operated agitator and low pressure burner, self-starting air cooled gasoline power unit. Mounted on tandem rocker beam assembly. Equipped with pneumatic tires and detachable (tire) tracks.
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14693 EAST COLFAX AVENUE, AURORA, COLORADO • 500 FIFTH AVENUE, NEW YORK CITY
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WEDGEPLUG VALVES NEED NO PLUG LUBRICATION

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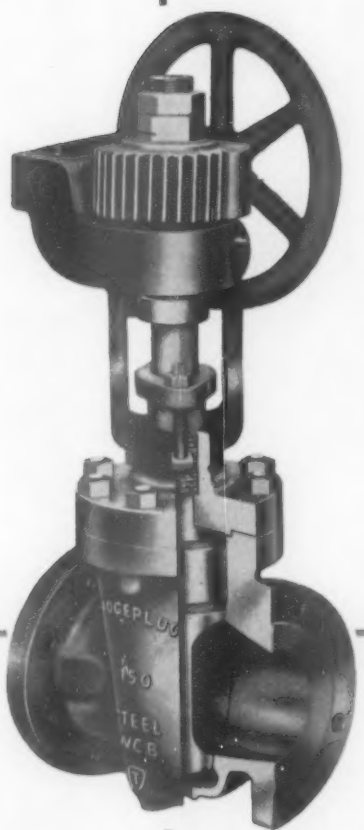

The Wedgeplug Valve is scientifically designed to operate satisfactorily without the need or use of a plug lubricant. The construction of the Valve assures a quick, positive lift of the tapered, non-lubricated plug from its raised, protected seating surfaces; the plug then turns 90 degrees; and, then is lowered and tightly reseated. All of this is accomplished in sequence, and in one operation, by a few turns of the handwheel . . . The raised seating surfaces are protected against erosion and corrosion, in both the "open" and the "closed" positions.

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STEEL PLUG VALVES

The Wedgeplug Principle assures dependable performance at both high and low temperatures and pressures.

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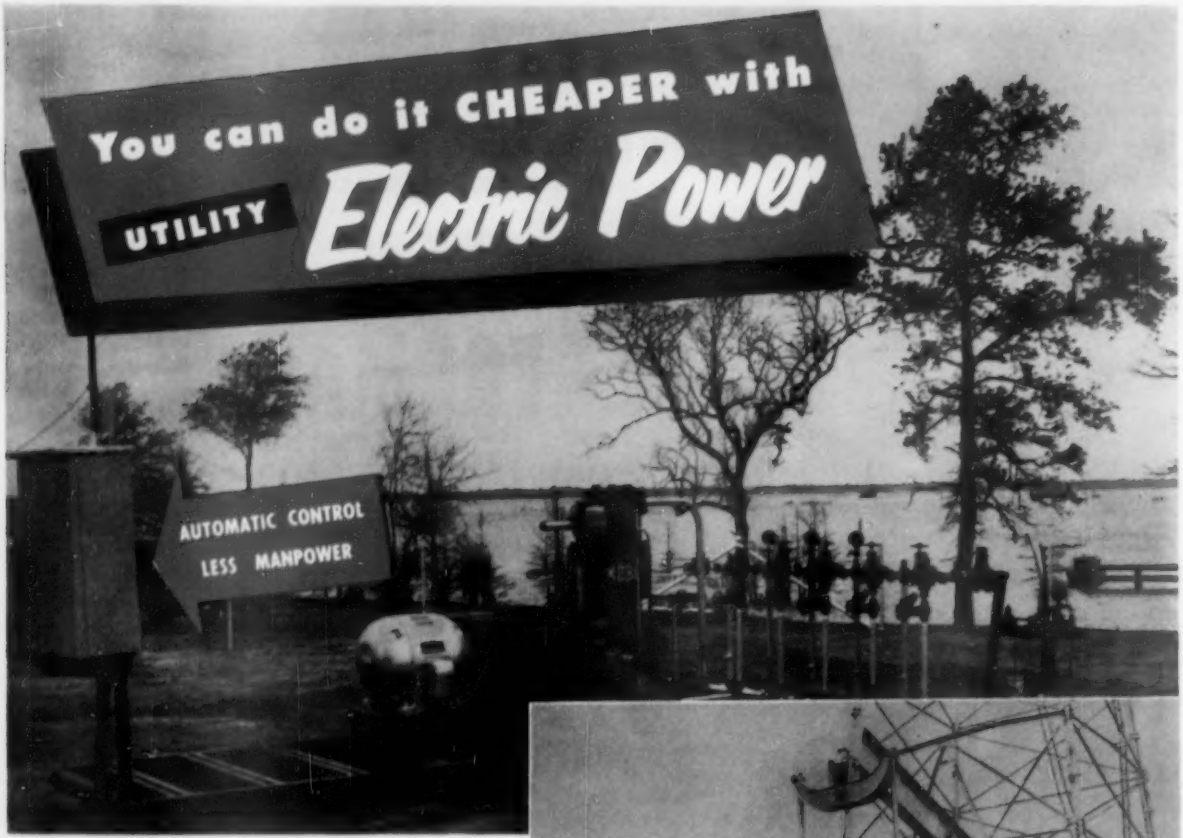

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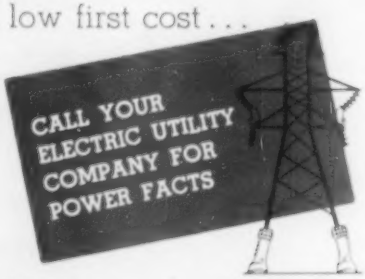
Oil Producers in Louisiana recognize the superiority of Low Cost Utility Electric Power for automatic, multiple or single well pumping. Electric power gives them advantages of low operating, maintenance and labor costs . . . low first cost . . . plus dependable, trouble-free efficiency. Analyze **your** power needs and then call your Local Utility Electric Power Company — they will show how Low Cost Electric Power will fill your needs.



Petroleum Electric Power Association

P. O. BOX 2771, DALLAS, TEXAS

ORGANIZED IN THE INTEREST OF GREATER SERVICE TO THE PETROLEUM INDUSTRY

two Cat MD7's and two MD8's before the new tractor moved in and replaced two of the MD7's and one MD8. The 583, equipped with a rubber-tired cradle and working with one MD8, lowered pipe at a rate of more than 2 miles per day.

Next it was switched over to the doping crew. Here it took the place of two MD8's and an MD7. Using a doubletree attached to two sets of six-wheel cradles, the machine supported the 5-ton doping machine and pulled a 23-bbl. dope pot and a supply sled.

On both lowering-in and doping jobs, the pipe was cradled about 7 ft. outboard of the near track.

Below are some of the big tractor's measurements and vital statistics:

LIFTING CAPACITY

Overhang (ft.)	Load (lb.)
4	130,000
6	85,200
8	63,100
10	49,900
12	41,200
16	30,300
20	23,800

Pipelaying equipment . . . The counterweights are adjustable and hydraulically controlled. The counterweight frame weighs 5,380 lb. and the 12 weights weigh 1,108 lb. each. Total extensible weight is 18,676 lb.

The load and boom drums operate independently or simultaneously. Capacity of the load drum is 625 ft. of ¾-in. cable or 370 ft. of ⅝-in. cable. The boom is of welded box type and is 20 ft. long.

Chassis . . . The machine has a ground clearance of 21 in. Its tracks are 28 in. wide with a gage of 86 in. Maximum track area in contact with ground is 6,580 sq. in. Weight of the chassis alone is 45,035 lb.

Engine . . . The tractor is powered with a six-cylinder, four-stroke cycle, valve-in-head diesel. At its maximum governed speed of 1,200 r.p.m. the engine delivers 190 hp. at the flywheel. Engine speed at maximum torque is 800 r.p.m.

Dimensions . . . With weights extended, the width is 16 ft., 8½ in. Stripped for shipping, the machine is 10 ft., 9½ in. wide. Length of the machine is 17 ft., 7¼ in. Its height without boom is 9 ft., 1½ in.

Shipping weight . . . Including counterweights and boom, the machine weighs out at about 78,000 lb.

Cost . . . Approximately $35,000.

NOTHING BEATS R/M Teflon*
FOR PACKING CHEMICAL PUMPS

Everywhere they're being used on chemical pumps and valve stems, packings made of R/M "TEFLON" are doing a tremendously efficient job. With their help, it is possible to meet most any chemical packing problem. Carefully engineered and custom-built for their applications, they are lasting longer in service and lengthening the life of the equipment they're used on. Actually, they're going a long, long ways towards making preventive rather than corrective maintenance possible. Write for complete information.

**Du Pont's trade-mark for its tetrafluoroethylene resin*

R/M MAKES A COMPLETE LINE OF PACKINGS AND GASKETS—AVAILABLE FROM YOUR R/M DISTRIBUTOR

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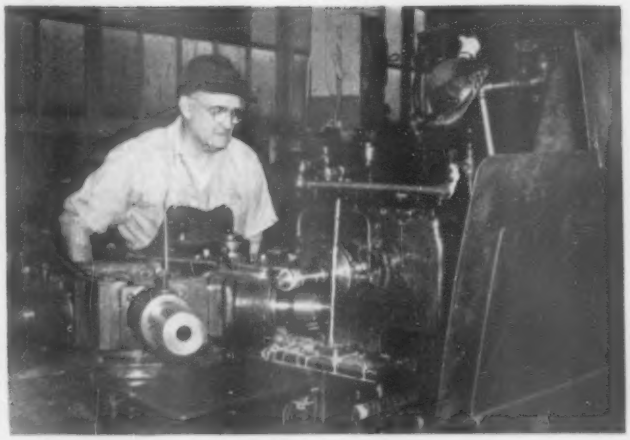
RAYBESTOS-MANHATTAN, INC.
PACKING DIVISION, MANHEIM, PA.

FACTORIES: Bridgeport, Conn.; Manheim, Pa.; No. Charleston, S.C.; Passaic, N.J.; Neenah, Wis.; Crawfordsville, Ind.; Peterborough, Ontario, Canada

RAYBESTOS-MANHATTAN, INC., Packings • Asbestos Textiles • Industrial Rubber, Engineered Plastic, and Sintered Metal Products • Abrasive and Diamond Wheels • Rubber Covered Equipment • Brake Linings • Brake Blocks Clutch Facings • Fan Belts • Radiator Hose • Bowling Balls

The Boardman Company, Inc., of Tulsa, is typical of the many P&H Dealers in the U.S. All P&H dealers are strong, well-established business houses — *reliable!*

That's Jack Catalane on the right, Sales Manager of the P&H Power Crane and Shovel Division, and his good right arm, Bob Jones. Nearly 100 P&H dealers are pinpointed on this map in the P&H home office.



P&H Dealers maintain complete service facilities and parts stock. Shown above is a typical P&H dealer shop view.

Whenever you need service in the field, call your P&H Dealer. You'll also find him your best source when you need additional machines fast, for special jobs.

SERVICE IS COMPLETE!

. . . and keyed to the special needs of the petroleum industry

Here it is! — the network of service-minded dealers spread the length and breadth of the country — for one purpose alone — to provide click-of-the-heels service for P&H users wherever they may be.

P&H has gone all out to build the finest kind of service for the unique and special needs of the petroleum industry. Whether you need a new bearing or a complete new machine, you'll find your P&H dealer on the job — ready, willing, and able to get it to you on the double.

Another thing — and this is important — P&H service men know their business. Repair parts? Your P&H dealer keeps adequate stocks of genuine P&H replacement parts on hand all the time. And backing him up are P&H's strategically located warehouses. You're never far from help with a P&H!

Stop in and see your nearest P&H dealer soon. Let him show you the most modern line of Power Cranes and Shovels in the business — Truck Cranes from 7 to 35 tons lifting capacity; Crawler machines from ½ through 3½ yards. The sooner you get this story, the sooner you can start saving money the P&H way.

Traveling schools are just one of the many ways in which P&H Dealers are kept informed of operating features and service techniques. Service is one reason why P&H is taking over — all over the country.

P&H POWER CRANE AND SHOVEL DIVISION

HARNISCHFEGER CORPORATION

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NEVER!

NEVER throw away a Goodall Rotary Hose! It can be repaired and save you money. Never throw away that famous Barney Coupling. It can be reset and save you money. Your Goodall Longlife Rotary Hose is a piece of fine equipment that can be maintained. It is the strongest, most flexible, most perfectly balanced rotary hose money can buy. Damaged Goodall hose can be repaired, for further use as rotary hose, or in shorter lengths as vibrator hose.

When you buy, buy the best – buy Goodall Rotary Hose – the hose with the built-in safety clamp. And remember, NEVER DISCARD A GOODALL ROTARY HOSE.

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Want more information on products advertised in this issue? Or do you want to know more about the items described in the "New Equipment Section"? Or would you like some of the literature here mentioned?

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Just use the convenient pre-stamped cards on this page. We'll forward your requests promptly.

To The Oil and Gas Journal. Please send me further information, without obligation, on items of New Equipment or Bulletins I have checked (✓) from your issue of February 28, 1955

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We do the rest

If you want additional information on any product advertised in this issue, note the page number on the card.

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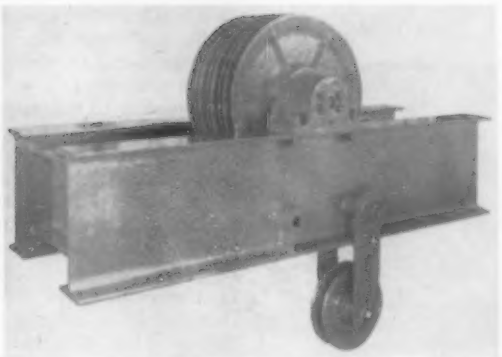
. . . What's New in Equipment?

Use the handy Time-Saver Cards ✓✓✓ to obtain additional information on these items

by Dan B. Miller



Crown Blocks Made for Companion Blocks

A new line of smaller crown blocks, known as Type E, are intended to match up with the Type E traveling blocks and Type E hook blocks. Type 430E is rated at 120 tons, Type 536E at 175 tons, and Type 642E at 240 tons.

The new crown blocks are of an over-all narrow design that provides a greater proportionate strength-to-weight ratio. The sheaves are mounted on a single shaft and held in a fixed lateral position, requiring no spacers. Wide-flared grooves of the sheaves, which are flame-hardened, eliminate line fouling with close spacing, and assure smooth running and long life. The shafts are forged from heat-treated alloy steel, with a high-strength factor.

Frames for the Type E crown blocks are fabricated from heavy-structural steel beam, with end-cross members welded to the side beams. A hangar-type cat-line sheave attachment, furnished with the block, may be mounted in any one of four positions below the side beams. A 24-in. diameter sand-line sheave attachment is available. *National Supply Co.*

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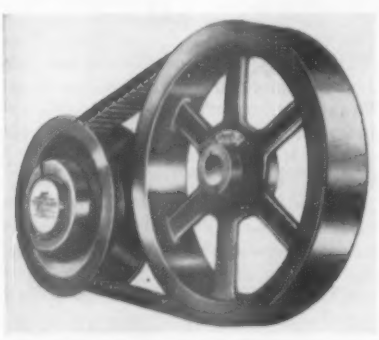

Variable Speed Drive Features Single Belt

A small variable speed drive is designed to give infinitely variable speed within a 2 to 1 speed-range ratio for 1 to 5 hp. drives.

Both flanges move simultaneously by a single adjusting screw to change the pitch diameter. Simplified design provides positive clamping of the two adjustable flanges, eliminating fretting corrosion. Flanges are easily released for making speed changes.

Single wide-range belt gives maximum horsepower efficiency and eliminates problem of maintaining matched belts and matched grooves for equal power distribution. Single-belt design reduces weight and space required. There are no grease fittings or oil cups to require preventive maintenance. *T. B. Wood's Sons Co.*

Check No. 2 On The Time-Saver Card

Three-Man Crew Operates New Tape Wrapping Unit

A new power-driven tape-wrapping machine is light, compact, and easily handled, and can be used on 2 to 36-in. pipe.

The unit will wrap tape and 15-lb. felt or kraft at the rate of 15,000 ft. per day with a three-man crew. The new machine was thoroughly tested and proved on the complete gas-distribution system.

The machine is self-propelled, forward travel being synchronized with the wrapping head by a Linkbelt P.I.V. unit. No change of sprockets is required when changing from one width of tape to another. *Remco Manufacturing Co.*

Check No. 3 On The Time-Saver Card

●

Recorder Charts Printed On Improved Paper

A new type of chart paper has special properties which improve the legibility of instrument records. The new Humitex circular and strip charts are printed under controlled humidity conditions on a white sulphite sheet, meeting rigid standards of uniformity and stability. Special sizing agents have been added

What's New... Use the handy Time-Saver Cards

to permit sharp, distinct recording without feathering.

Scale markings and time arcs are printed in a neutral gray for vivid contrast with colored recording inks. Circular charts are printed and center-punched in the same operation, holding eccentricity tolerance of less than .002 in. between hub hole and scale circles. The printing plates are produced to tolerances of .00025 in.

The charts were designed for use with new sediment-free Type 1500 general-purpose ink and Type 316 stainless-steel pens to provide a complete set of precision recording components for the company's line of recording instruments. *Foxboro Co.*

Check No. 4 On The Time-Saver Card

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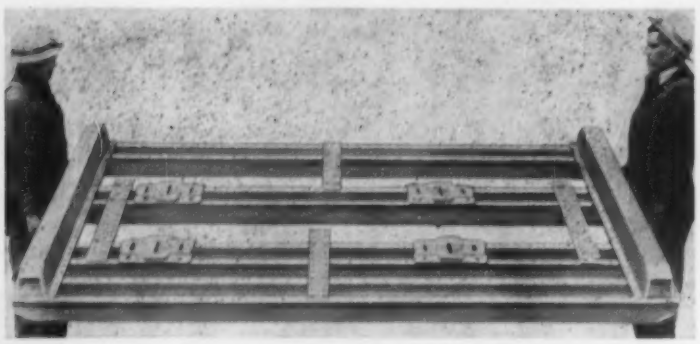


Skids Designed for Convertibility

The new Tumco universal safety skid, adaptable for moving or crosscountry skidding without dismantling of drilling equipment, is made of heavy-aluminum-extruded members. The skid is designed to save time and money in the moving, shipping, and storing of machine tools and industrial equipment. Based on simple assembly and versatility, the Tumco skid is available in 25 standard lengths which can be used as either headers or runners to assemble approximately 325 different skid sizes.

Using only a wrench, the Tumco skid can be assembled and loaded in approximately 1 man-hour. A completed 5 by 10-ft. skid can be easily lifted by two men and yet has a load-bearing capacity of up to 80,000 lb. Tapered-wing channel-shape members absorb and distribute impact loads throughout the skid and lessen the shock absorbed by machine or equipment.

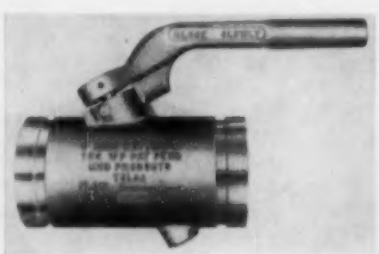
Bottom faces of skid members have been made thicker than sides to compensate for wear over long periods of use. These bottom flanges also have sufficient area to support heavy machines or equipment on earth, or other comparatively soft surfaces.

Because of its permanent nature and universal design, the skid can be disassembled into its different members and reused time after time. Due to the nature of the extrusions used, it can be disassembled and nested for storage in small space. *Tumpane Co. of Georgia, Inc.*

Check No. 5 On The Time-Saver Card

Grooved Ends Available on O-Ring Butterfly Valve Line

Mudco O-ring butterfly valves are now available with grooved ends in 2, 3, and 4-in. sizes for use with grooved-type couplings. This new valve provides a faster, easier method of coupling pipe, combined with the other important Mudco advantages of a quick-opening, positive-seal valve which does not require lubrication, and offers less restriction to flow. These combined features provide a valve that is particularly



adaptable for installation on tank batteries, production headers, and waterflood and salt-water disposal systems.

Grooved-end valves are produced from semisteel for general-purpose applications and ceramic-lined semisteel for handling corrosive fluids. This new valve can also be furnished in aluminum bronze, stainless steel, or aluminum. *Mud Products, Inc.*

Check No. 6 On The Time-Saver Card

●

Silicones Improve Big D Dope Thread Compound

A survey of drilling engineers and maintenance executives in industry generally, has resulted in the addition of silicones to Big D Dope, a metallic-lead thread compound.

According to the survey, drilling engineers were especially concerned with reduction of materials and man-hours wasted in applying thread compounds to pipes that become wet on waterflooded drilling platforms. Substantially greater efficiency was obtained with fewer pounds of silicone-fortified Big D, under the most extreme moisture conditions. In addition to fighting off the water and permitting even, smooth spreading, the silicone gives extra protection against high temperatures and pressures. *C. H. Dragert Co., Inc.*

Check No. 7 On The Time-Saver Card

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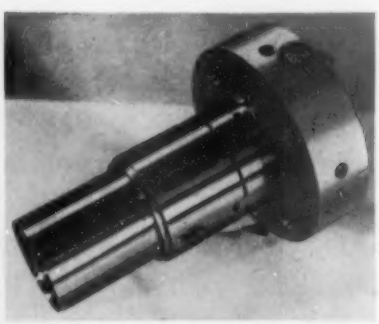


Mechanical Seals Made for High-Pressure Boiler Feed

A new type of mechanical seal for high-pressure boiler-feed pumps stops liquid loss, reduces heat loss, and requires no operating adjustment. These new seals are now in operation in a number of high-pressure, hot-water pumping operations including temperatures up to 430° F. Some of these seals have been in service as long as 3 years and reports show that heat and liquid loss is minimized and frequent repacking problems are eliminated.

As far as is known, this is the first successful application of a mechanical seal to large, high-pressure, high-temperature power pumps. *Byron Jackson Co.*

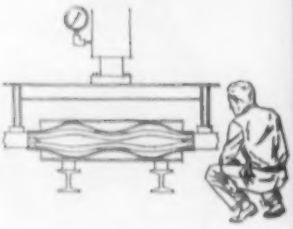
Check No. 8 On The Time-Saver Card

Inspect it –

IT LOOKS BETTER

Test it –

IT CHECKS OUT BETTER



Use it –

"MAXIMUM PERFORMANCE" JOB

LARKIN EXCEEDS EVERY KNOWN REQUIREMENT FOR CENTRALIZER PERFORMANCE

Based on established standards, Larkin Centralizers

Take 45% less permanent set than maximum allowed

Exert 300% more initial centering force than minimum required

Start easily without bumping or snubbing

FIVE RANGES—FOUR TYPES. Each of the four different types of Larkin Centralizers come in five different ranges.

The Short Larkin Slip-On and Lok-On Centralizers fill the requirements of efficiency and economy in shallower areas or on short strings in undeviated holes.

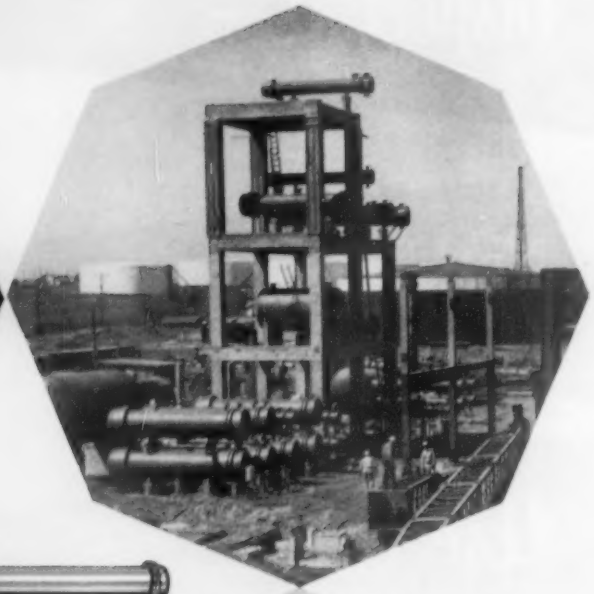
Specify Larkin to your Supply Store.

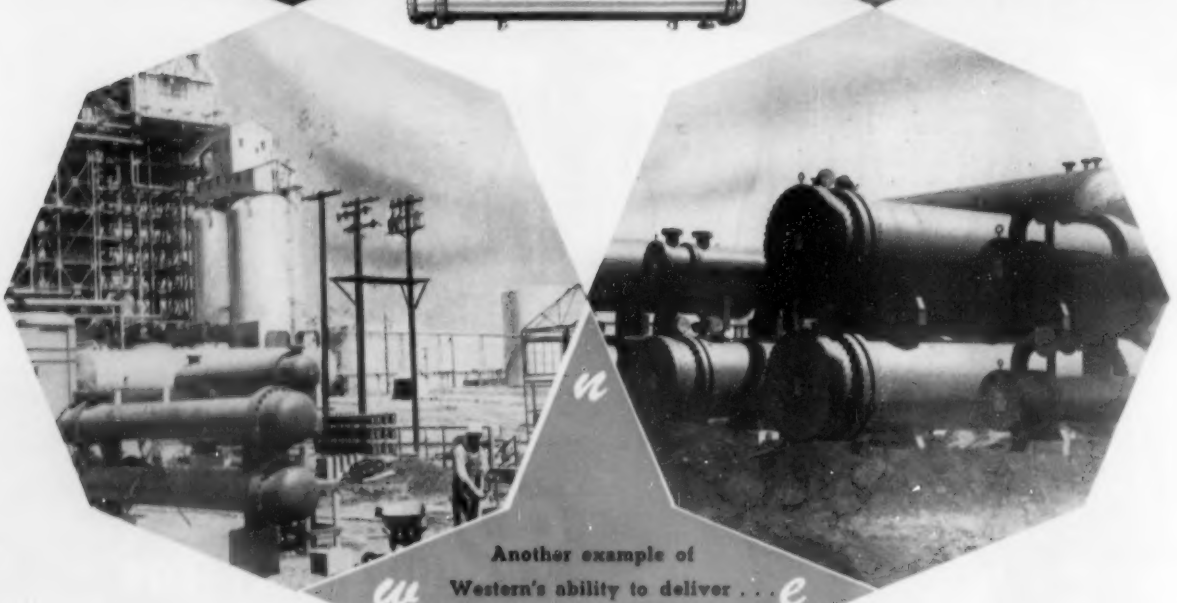
LARKIN

Through Your Supply Store

LARKIN PACKER COMPANY, INC. • **ST. LOUIS, MO.**

SUNRAY
NATURAL POWER
OILS





Another example of Western's ability to deliver . . . on time!

Shown above are Western heat exchangers installed in the Coking Unit superstructure at Sunray's Duncan, Oklahoma refinery. These photographs need no further explanation to men familiar with construction schedules.

Within a period of 8 weeks Western delivered all of the exchangers for The Lummus Company-built Coking Unit. . . The Refinery Engineering Company-built Platforming Unit. . . plus 19,000 square feet of Main Column Condensers for the Universal Oil Products Cat-Cracker.

For this one Sunray investment program — 46 heat exchangers from Western Supply Company aggregating a half million dollars worth of equipment.

WESTERN
HEAT EXCHANGERS
WESTERN SUPPLY COMPANY
P. O. BOX 1888 • TULSA, OKLAHOMA
HUDSON-RUSH COMPANY—753 Gladstone Blvd., Shreveport, La.
130 Casa Linda Plaza, Dallas 18, Texas
PROCESS INSTRUMENTS & EQUIP. CO. - North Bldg., Charleston, W.Va.

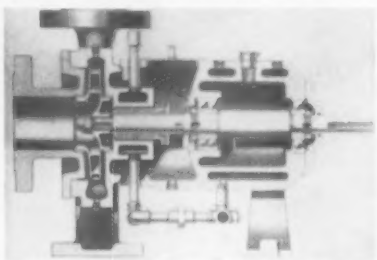
What's New... Use the handy Time-Saver Cards

Centrifugal Process Pumps Feature Interchangeability

Interchangeability of parts is one of the outstanding features of a newly re-engineered and completely integrated line of single-stage, end-suction, centrifugal pumps.

In the R-10 series there are 11 pumps ranging in size from 1 by 2 in. to 4 by 6 in. Yet, one standard cradle assembly serves for all 11 pumps. Size and capacity of each pump is determined solely by variations in the size of only three parts; the casing, impeller, and suction nozzle.

Features such as the enclosed cradle; drain-rim base; labyrinth; nonsparking bearing seals; rabbetted joints; alloy-steel studs; and stuffing boxes inter-



changeably adapted to packing or mechanical seal, are all of standard construction.

The complete pump line has an extensive capacity range. For high-temperature services up to 850° F., three series with a total of 32 pumps are available for capacities from as low as 3 g.p.m. up to 7,000 g.p.m. The same pumps are available and interchangeable in three parallel or companion series for temperatures up to 350° F.

Every pump in the entire line is available in any of five standard material classifications. Pumps can also be furnished in almost any other commercially available material. In any one series, one pump shaft, one stuffing-box gland, and one seal ring fits all pumps. *Dean Brothers Pumps, Inc.*

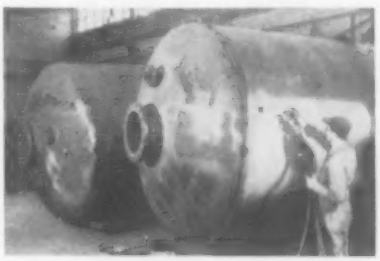
Check No. 9 On The Time-Saver Card

●

Hot-Spray Vinyl Developed For Corrosion Control

A new hot-spray vinyl is specifically engineered for economical corrosion control. Prufcoat's new hot-spray vinyl application is carried out at low fluid tank pressures of 15 to 20 psi. A simple two-coat system, one Prufcoat P-50 prime coat and one Prufcoat hot-spray-vinyl coat is just right for the bulk of plant-maintenance painting applications.

Because of more rapid solvent evaporation, and less solvents to start with,



vinyl sets quickly on the surface to give heavier, higher-build applications without sagging. Resulting advantages are: time savings because fewer coats and faster application; more build per coat and lower total cost per square foot of surface; no thinners are needed, meaning simpler application, and better spraying conditions; increased coverage per gallon because of less waste through overspray; and better, thicker film, and heavier film buildup on hard-to-protect edges and projections. *Prufcoat Laboratories, Inc.*

Check No. 10 On The Time-Saver Card

●

Switching System Controls Lease Automatically

A new system providing for automatic control of lease operations includes controls, instruments, and valves that perform all basic functions of filling storage tanks and opening and closing in wells in accordance with production requirements, storage capacity, and pipeline runs.

Basically, the system is pneumatically operated, using supply-gas pressure of 25 psi. or less, however, the pneumatic controls can be supplied with Mercoid switches and solenoid valves to provide for electrical operation when desired. The entire pneumatic system is non-bleed, and the small amount of supply gas required can be supplied by the separator in nearly every instance.

Applicable to all tank-battery designs, manifolding arrangements, and production methods, this automatic tank-switching system obviates the necessity of constant attendance; eliminates the hazards of climbing to tank roofs in order to gage tanks; and guards against the loss and danger occasioned by flowline breakage, cut-out chokes, and excessive flow-line and separator pressure. It can be supplied with, or will operate in conjunction with any type of automatic gaging, separating, or calibrating vessel or instrument. *Garrett Oil Tools, Inc.*

Check No. 11 On The Time-Saver Card

●

Peat Moss Product Offered For Lost Circulation

A new material for the control of lost circulation problems in drilling is derived from Canadian peat moss, and bears the trade name of Expanso-Seal. Tests in several wells in southern California gave successful results in all cases. Used alone or as a supplement to the other materials, Expanso-Seal was found in the tests to reduce by as much as one-half the time normally required to regain lost circulation. The composition of the new product permits controlled expansion several times its initial volume, thereby completely filling voids in porous formations. *Wilson Meyer Co.*

Check No. 12 On The Time-Saver Card

●

Big R-V Engines to Fill In Pipeline Operations

The new Enterprise R-V, a 16-cylinder, 6,150-hp. engine will power vessels in the larger classifications, from large towboats to ocean-going cargo carriers, and in the stationary field will fulfill basic power requirements. Its compactness makes it specially suited for use in dredges and for service in the petroleum industry's large pipeline operations. The R-V offers features which meet the demand from the field for higher horsepower ratings within the space, volume, and weight limitations of potential power installations.

Its design incorporates opposite cylinders in the same plane. This elimination of the staggered or offset cylinder design decreases the cylinder spacing and reduces the over-all length of the engine by as much as 20 per cent.

Design of the connecting-rod and piston assembly enables the removal of the entire assembly by the release of six clamping bolts and withdrawal of the assembly through the cylinder liner. The master connecting rod and cap joint is of the rack-tooth type, enabling the distribution of the stresses in the joint over the greatest possible area.

R-V has a base of a single casting, with low, wide mounting flanges and linebored bearing caps. Bearing supports are designed to provide greatest rigidity. The crankshaft is forged alloy steel, machined all over. *Enterprise Engine & Machinery Co.*

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EXTRA

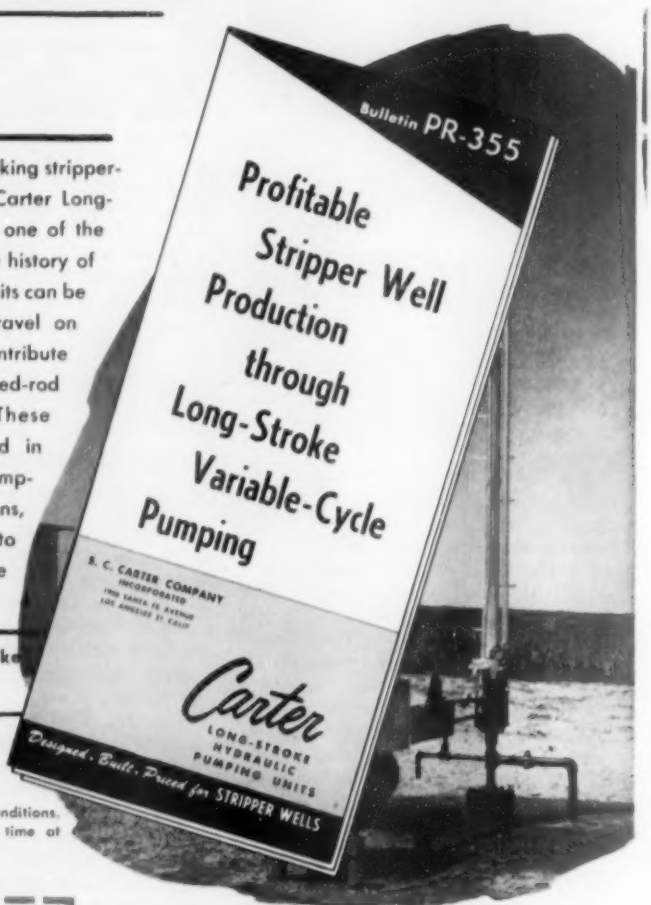
JUST OFF THE PRESS

EXTRA

THE COMPLETE STORY OF THE VERSATILE CARTER LONG-STROKE HYDRAULIC PUMPING UNIT...FOR MORE STRIPPER-WELL PROFITS!

Your copy is ready now
Write for it today —

Our new folder tells why wise operators are making stripper-wells pay bigger profits through use of the Carter Long-Stroke Hydraulic Pumping Unit. You'll find it one of the most interesting and enlightening stories in the history of pumping equipment. You'll know why Carter units can be readily adjusted for any desired rate of travel on upstroke and downstroke . . . how they contribute to high pump efficiency with constant polished-rod velocity throughout the pumping stroke. These advantages, and more, are fully explained in our new folder. The unparalleled Carter pumping unit has been proved under all conditions, with over 900 now in use. You'll want to know about it. Order your free copy of the Carter story now.


Bulletin PR-355
Profitable Stripper Well Production through Long-Stroke Variable-Cycle Pumping
S. C. CARTER COMPANY INCORPORATED
Carter
LONG-STROKE HYDRAULIC PUMPING UNITS
Designed · Built · Priced for STRIPPER WELLS

Among outstanding features of the Carter Long-Stroke Variable-Cycle Pumping Units are:

1 — Extended life of sucker rods and sub-surface equipment.
2 — Increase in volumetric efficiency of well pump.
3 — Reduction in possibilities of well-pump gas lock.
4 — Substantial lowering of factors producing sanding-up conditions.
5 — Overall improvement in well productivity for longer time at increased rates.

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- Catalogs
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for your copy, check ✓ ✓ the Time-Saver Cards.

MSA Mask. A newly designed mask which supplies fire fighters and industrial workers with oxygen or air as desired, is described in Bulletin No. 0105-5. The MSA mask is available in two models, the air mask and the O_2 mask. Either combines a supply of air or oxygen with a demand regulator to provide 30-minutes service in highly toxic or oxygen-deficient atmospheres. A back-mounted cylinder supported by a lightweight metal frame, is held by nylon harness to the wearer's body. The entire mask weighs only 30 lb. *Mine Safety Appliances Co.*

Check No. 14 On The Time-Saver Card

●

Fabricated Products. Specific services and facilities offered to the power-piping field, including fast, accurate methods of stress analysis, metallurgical research, new welding methods, and special heat-treatment techniques, are described in a new 12-page booklet. Informative feature of the booklet is a step-by-step picture story from joint positioning to final induction heat treatment of the new welding technique, identified as the K-Weld process. *Fabricated Products Division, M. W. Kellogg Co.*

Check No. 15 On The Time-Saver Card

●

Oil-Field Equipment. This eight-page brochure illustrates drill collars, kellys, a winch for running measuring equipment, a rotary table, draw works, a mobile rig, quick-action slide valves, high-pressure and low-pressure cocks, and a plug valve for introducing and expelling a go-devil. *Hermann von Rautenkranz, Internationale Tiefbohr-K.G.*

Check No. 16 On The Time-Saver Card

●

Le Roi L3000, H2000 and F1500. Just published, a colorful bulletin, No. E-9, describes and illustrates the 115 and 410 hp. Le Roi L3000, H2000, and F1500 engines. The eight-page, three-color bulletin uses cutaway views and photographs to show advanced features such as modern valve-in-head design. Some of the other features discussed, include: Full-length guided valve-stem mechanisms, lightweight cam-ground aluminum pistons, drop-forged crankshafts with polished bearing surfaces, full-flow oil filters, sectional water-cooled exhaust manifolds, large main bearings, full-pressure lubrication and conveniently located controls. *Le Roi Division, Westinghouse Air Brake Co.*

Check No. 17 On The Time-Saver Card

●

Air Reduction Supplies and Accessories. A new, 36-page catalog, ADC 848, covers a complete line of arc-welding and oxyacetylene-welding supplies and accessories. Included in this booklet are welding rods, fluxes, brazing alloys, goggles, helmets, shields, electrode holders, protective clothing, cable, clamps, hose, lighters, cylinder trucks, and carrying cases. *Air Reduction Sales Co.*

Check No. 18 On The Time-Saver Card

●

Low-Cost Indicating Temperature Controller. Performance specifications, application ideas, and a complete description of a new liquid-filled, remote-indicating temperature controller, are presented in a two-color brochure, MC-122. Feature of the unit, designated as Series 540 controller, is the easy adjustability of the control bandwidth, which can be set between 1 and 4 per cent of scale. Operating range is 100° to 700° F., with control characteristics and sensitivity maintained uniform throughout the entire range. *Fenwal, Inc.*

Check No. 19 On The Time-Saver Card

●

Spang Extreme Line, integral-joint, oil-well tubing in seven sizes and three grades is described in a colorful, new, eight-page bulletin, No. 414. Also included are recommended practices for running and pulling tubing. *Spang-Chalfant Division, National Supply Co.*

Check No. 20 On The Time-Saver Card

●

Radiation Instruments for Locating Metals, a 12-page, multicolor brochure, offers extensive data and illustrates a line of radiation instruments for locating metal, metal ores, and uranium. Accessory equipment for these instruments is also listed. *Precision Radiation Instruments, Inc.*

Check No. 21 On The Time-Saver Card

●

Air or Gas Drilling with Rotating Blow-out Preventers. A new service manual, Bulletin RBP, outlines the principal features of air and gas-drilling procedures, shows typical installation hookups,

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5070

INTERNAL SAFETY VALVE

A quick closing emergency shut-off valve designed to automatically cut off flow out of tank in case of fire. Valve is spring-loaded and is held in open position by a fusible link which melts at 160°F. When this link melts, spring action completely closes the valve.

New features include:

1. VALVE CAGE WITH BOTTOM PORTION CLOSED TO MINIMIZE AGITATION OF SEDIMENT ON FLOOR OF TANK.
2. VACUUM BREAKER INCORPORATED IN PALLET FOR EASE OF OPENING.
3. OPERATING LEVER LINKAGE ARRANGED FOR POSITIVE MANUAL SHUT-OFF.
4. VALVE SEAT FACED WITH STAINLESS STEEL TO RESIST CORROSION.

Standard construction is steel body with bronze valve disc. May be mounted on standard A.P.I. or VAREC Fig. No. 308 Series Tank Shell Nozzles. Available with Series 15 or Series 30 Flanges. Available sizes: 4" x 6", 6" x 8", 8" x 10", 10" x 12" and 12" x 14".

"Varec"

VAPOR RECOVERY SYSTEMS CO.
2820 No. Alameda St., Compton, Calif.
Cable Address:
VAREC COMPTON, Calif. (U.S.A.) All Codes

961-5

gives case histories of gas-drilled wells in the Farmington, N. M., fields and air-drilled wells in the Ventura, Calif., fields. In addition, a section on reverse circulation drilling discusses the latest techniques in this field, both in drilling and fishing operations, and illustrates a typical reverse circulation hookup. *Shaffer Tool Works.*

Check No. 22 On The Time-Saver Card

●

How to Buy Oil-Industry Hose. This new brochure deals principally with the selection of the right hose for each oil-industry application. In addition to illustrations and data on each type, the catalog includes a list of supply companies that stock oil-country hose. *Republic Rubber Division, Lee Rubber & Tire Corp.*

Check No. 23 On The Time-Saver Card

●

Hydraulics for Jet Bits has been prepared for use at the rig. Answers to many of your jet-bit drilling problems are included. The bulletin is fully indexed. Tables and work sheets make it easy to select the liner size, circulation rate, and bit-nozzle size to make the most efficient use of the hydraulic horsepower available. *Hughes Tool Co.*

Check No. 24 On The Time-Saver Card

●

Michigan ½-Yd. Truck Excavator-Cranes. This bulletin gives complete engineering details on the 16-ton axles, 404-cu. in. engine, cast-steel turn table, air-powered clutches, and six-hook rollers, all standard equipment on this ½-yd. model. *Clark Equipment Co.*

Check No. 25 On The Time-Saver Card

●

Dual Rambler, an ad reprint, illustrates the outstanding features of a new, fast-moving, guyless rig. The rig gets its name from the fact that the power to drill slim hole to 9,000 ft. and a 105-ft. mast pack into two compact 8-ft. road-width trailers. Folding walkways provide working area of 16 by 18½ ft. *Ideco, One of The Dresser Industries.*

Check No. 26 On The Time-Saver Card

●

Warren Realwear Horizontal Duplex Steam Pump. This new four-page Bulletin 230 explains the advantages of this special construction, including 95 per cent recovery of fuel costs when exhaust steam is utilized. Sectional and exterior views, specifications, capacities, and dimensions are also included. *Warren Steam Pump Co., Inc.*

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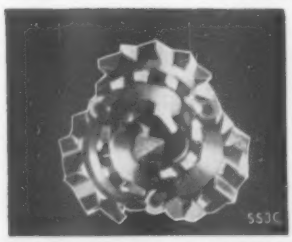
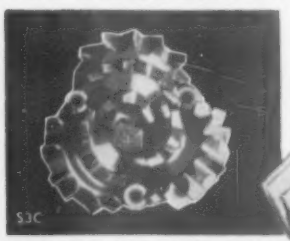
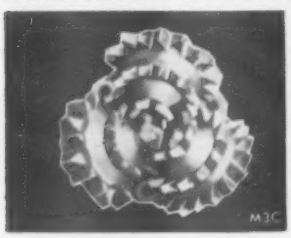
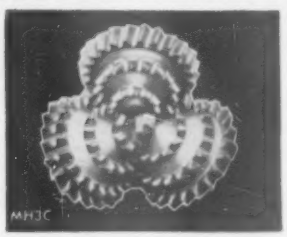
...here's the
new

GLOBE
3-CUTTER
ROCK BIT
REGULAR and JET TYPE









MHJC

The rapidly growing popularity of the Globe "3-Cutter" is no accident. Instead, it is a "hard boiled" dollars and cents evaluation based on PERFORMANCE that has resulted in lower cost, more economical oil well drilling.

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Descriptive Bulletin No. 55-3R is now available. Copies will be mailed on request.

Main Office and Plant: LOS NIETOS, CALIFORNIA
Branches are located in all principal drilling areas.

EQUIPMENT MEN . . . in the News

Tuboscope Occupies Executive Annex

Tuboscope Co. has recently completed and occupied this new executive annex to the main plant at Houston. The annex contains 3,800 sq. ft. of space including a large reception room, conference room with adjoining kitchen, and six large offices.

The four buildings at Tuboscope total 14,400 sq. ft. of space including 4,800 sq. ft. in shops and warehouse space, and 1,800 sq. ft. in lab space. The first building houses the executive offices, accounting, purchasing, and caliper report sections, and warehouse space and the machine shop. The automotive repair shop and welding shop is located in the second building. The third building is used as offices and storage space for the Houston district personnel.

A 600-ft. test hole for use in checking caliper instruments is located at the back of the property.

J. & L. Supply Completes Annual Sales Meeting

President C. L. Austin and J. A. Timberlake, vice president, sales, of Jones & Laughlin Steel Corp., Pittsburgh, delivered addresses to 43 Supply Division sales administrative officials at the conclusion of a 3-day sales management conclave on February 2.

District and assistant district sales managers and sales office managers from 11 states and Canada convened with Tulsa office executives at the Mayo Hotel, on January 31, to begin sessions of the division's annual sales management meeting. The opening day's activities were devoted to presentations of organizational procedures followed by 2 days of interviews with Tulsa office executives.

The J. & L. Supply Division, headquartered at Tulsa, supplies tubular goods, pumping units, wire rope, and a complete line of oil-country equipment to oil-well drillers and oil producers in 18 states east of the Rockies and in 3 provinces in Canada. The firm maintains 84 supply stores and 5 sales offices in the western and southwestern sections of the United States, and an office and 5 stores in Canada.

J. & L. personnel at the sales management meeting in Tulsa were: front row seated: H. J. McAdams, J. T. Batchelor, A. G. Bastian, R. J. Woods, Jr., J. E. Timberlake, C. L. Austin, Rainey Elliott, H. H. Wilson, L. G. Sutter, R. D. Hilborn, P. R. Warner. Second row seated: R. W. Dense, C. A. Nicklas, A. F. Stadler, F. L. McFarland, A. G. Wehrley, F. C. Bryan, J. A. Evans, Jr., G. A. McDaniel, L. R. Roberts, V. H. Weldon, Jr., R. T. Bouldin, M. L. Eubank. First row standing: D. E. McCormick, H. H. Ray, Doyne Carson, C. R. Jones, Joe Heineman, C. J. Jernigan, C. T. Owen, J. W. Berry, F. R. DeWitt, H. E. Wagner, W. R. Layne, C. H. Maxwell, H. H. Brown, C. E. Rogers, O. M. Lorenz, H. U. Everett, R. C. Hunter, G. A. Sears, W. R. Clarke, Henry Franks. Second row standing: W. L. Vinson, T. I. Estes, F. A. Street, Jack Judd, M. A. Park, J. B. Shakeley, H. D. Stanley, G. A. Pryor, H. L. Wilkins, J. R. Johnston, W. J. Farwell, R. Z. Dallas. Third row standing: W. M. Douglas, A. A. Hopper, O. P. Watkins, J. A. Tucker, W. O. Hardy, O. A. Bergmann, U. G. White, Jr., J. B. Gibson, J. K. Guinn, J. A. Carrigan, G E. Best, D. T. Ottinger, R. B. Putnam, and F. W. Durbin.

Otis Names Managers for South and West Texas

Otis Pressure Control, Inc., has announced the appointment of two new division managers. Warner M. Kelley, formerly South Texas division manager of the caliper department, has been named South Texas division manager

W. M. KELLEY

W. T. MITCHELL

for Otis, and William T. Mitchell, former southern Louisiana division superintendent, has been promoted to manager of the West Texas division.

Kelley has been with the firm for 10 years; he began as a sales engineer in Houston, was promoted to a division engineer, and subsequently was named to manage Otis' calipering department. Prior to joining Otis, he was with Edwards Drilling Co. and Pan-American Production Co.

Mitchell has been with the company 9 years, handling wire-line service work, for Otis in its Longview, Houma, and New Iberia, La., branches.

Weco Names R. E. Dewhirst To Ark-La-Tex Area

R. E. DEWHIRST

The appointment of R. E. (Bob) Dewhirst as sales representative for the Ark-La-Tex area has been announced by John Gates, sales manager for Well Equipment Manufacturing Corp., Houston. Dewhirst will make his headquarters in Shreveport, La.

Dewhirst was with Tide Water Associated Oil Co. for 4 years as scout, and with National Supply Co. in El Dorado, Ark., as sales representative.

As a member of Weco sales organization, Dewhirst will be representative not only for Weco unions, blocks, and compounds, but for Chiksan swivel joints, steel rotary hose, mud guns, and other oil-country products in his territory.

Caterpillar Appoints Pipeline Representative

In a move designed to aid pipeline contractors, Caterpillar Tractor Co. has announced the appointment of D. F. (Don) Coonan, former earthmoving representative, as special pipeline representative in domestic sales.

Coonan will devote his full time working with Caterpillar dealers and pipeline contractors. As liaison man, his duties will embrace all pipeline operations in the United States and Canada.

While serving as earthmoving representative in the western division, Coonan contacted various earthmoving and pipeline contractors. His previous experience also includes assignments in central sales, sales training, and sales development. He will make his headquarters at the company's main office in Peoria, Ill.

Hamer Valves Holds Sales Meeting in Long Beach

Hamer Valves sales representatives from all parts of the United States and Canada gathered recently at the Hamer plant in Long Beach, Calif., to attend a 4-day sales meeting and preview the company's promotions planned for the coming year. In addition to discussion of sales forecasts and tour of plant facilities, the representatives inspected the Hamer visible wedge, a valve which will be placed on the market early in 1955. Pictured above are, top row: Tom Martin, Tom Andrews, Sr., Ben Brundage, Vernon Zillgitt, Chuck Short, Howard Summerell, Ralph Stockton, Dave Preston, Tom Andrews, Jr., Joe Hall, Cleo Williamson, Ray Sexton, Fred Phipps, and Paul Comer. In the bottom row are: Guy Warren, Andy Anderson, Shorty Hamer, Mel Hamer, Floyd Hamer, Morrie Holladay, Carl Gast, Phil McLaren, and Al Ferguson.

Franks Manufacturing Makes Personnel Changes

K. M. LAMER

W. G. PITEZEL

J. G. LEYH

To mark the beginning of a division of its sales and service force, personnel changes have been announced by Carl White, Jr., president of Franks Manufacturing Corp., Tulsa. K. M. Lamer, a 13-year veteran with Franks, will fill the post of assistant sales manager at Tulsa.

W. G. (Bill) Pitezel, also a 13-year veteran, will take over Lamer's former position in Odessa as West Texas district sales manager. Pitezel's former position as Oklahoma district sales manager will be filled by J. G. Leyh, who joined Franks in 1940, and who has been Franks used-equipment manager.

Louis Sears becomes West Texas district service manager, and Albert Wagner will be parts manager in the Odessa, Tex., office.

Joe S. Winter will take over as service manager for West Coast operations to be located at Compton, Calif., according to R. M. White, vice president in charge of West Coast business.

The service managers will be in charge of Franks complete line of self-propelled oil-well servicing units and portable drilling rigs at Franks field-service branches.

Rockwell Subsidiary Names Milleville Chief Engineer

B. J. MILLEVILLE

B. J. Milleville has recently been appointed chief engineer at Edward Valves, Inc., East Chicago, Ind., subsidiary of Rockwell Manufacturing Co., according to an announcement by W. F. Crawford, Edward president and member of the Rockwell board of directors.

Milleville is only the fourth man in the 50-year history of Edward Valves to hold this position. He was formerly assistant chief engineer and succeeds David MacGregor, Edward works manager, who retained the duties of chief engineer along with his present responsibilities during the past 1½ years.

As chief engineer, Milleville will be responsible for the development of product and tool design and will report directly to L. H. Carr, Edward director of engineering and research.

Before working at Edward, Milleville was employed as a project engineer at Allis-Chalmers Manufacturing Co., Milwaukee, where he worked in the turbo-power development department.

Pioneer Elects M.T. Works As President

The recent election of Madden T. Works as president has been announced by the directors of Pioneer Specialties, Inc., Houston, makers of slush-pump pistons, piston pullers, and liner pullers. Works has been connected with the oil-field specialty-equipment business since before finishing college. He was with Cameron Iron Works, Inc., for a number of years in various capacities, including those of sales manager and chief engineer. Works has more than a score of patents to his credit and just prior to joining Pioneer was engaged in product development work.

Manning, Maxwell & Moore Forms New Division

E. M. MOORE

To accelerate the growth and use of American-Microsen electronic process-control and transmitting instruments, Manning, Maxwell & Moore, Inc., has formed a new Industrial Controls Division located in the company's Stratford, Conn., plant.

Eugene M. Moore, who has been

with the company since 1937, has been named manager of the new division. Karl W. Peterson is sales manager and C. Garland Roper, chief engineer. Moore has held several executive positions with the company including that of Pittsburgh district manager, assistant to the general manager of the Shaw-Box Division, and assistant works manager of the Watertown, Mass., plant.

Schlumberger Announces Field Staff Changes

J. R. PEASLEY

Eight field and headquarters promotions and transfers have been announced by the Schlumberger Well Surveying Corp.

John R. Peasley has been transferred from location manager at Mount Carmel, Ill., to the technical staff of the operations department at Houston. Vance E. Moss replaces Peasley at Mount Carmel. He was formerly location manager at Mount Pleasant, Mich.

C. B. Evans has been named assistant to the division manager at Oklahoma City. He was formerly location manager at Newhall, Calif.

Guy Sullaway has been transferred from location manager at Cushing, Okla., to assistant to the division manager, Gulf Coast division in Houston. He has been replaced at Cushing by G. H. Morris, formerly location manager at Russell, Kans.

E. A. Colle, who has been an engineer in the operations department in Houston, has been appointed assistant to the area manager, Southeast area, New Orleans.

C. B. EVANS

G. SULLAWAY

J. J. Maricelli is now assistant manager of the South Louisiana division, Gretna, La. He was formerly area staff specialist for the Southwest area.

C. R. Miller, formerly assistant to the division manager at Oklahoma City, has been transferred to Wichita, Kans., as assistant division manager, Kansas division.

M-C-M Completes Hard-Chrome Plating Plant

This hard-chrome plating plant has just been put into operation in Oklahoma City by M-C-M Machine Works for the specific purpose of serving the oil industry. In the foreground are large plating vats built to accommodate any major part up to 8 ft. wide, 14 ft. long, or 8 ft. deep. The equipment and facilities of M-C-M Machine Works are devoted to rebuilding or adding to the service life of machine parts.

Mid-States Chemical Opens Houston Sales Office

Mid-States Chemical Co., Inc., has recently opened a sales office in Houston and Doyle Johnston has been assigned the title of district sales engineer. Johnston joined Mid-States in September 1954.

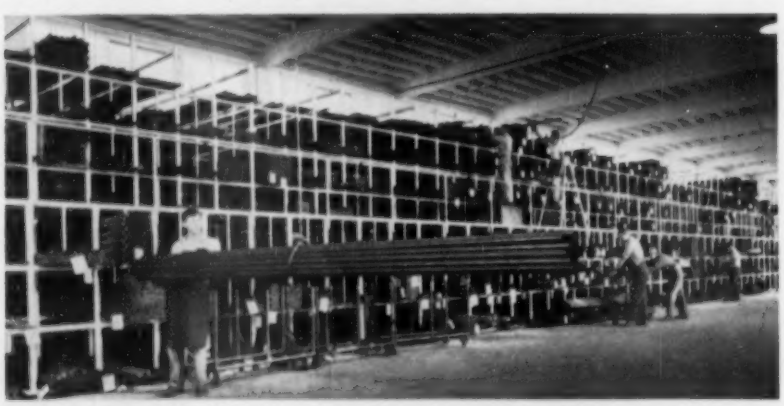
Since 1934, Johnston has been actively engaged in the oil industry, having worked for Stanolind Oil Co. for 10 years in the production department and as production foreman. He had been with Johnston Testers, Inc., for the last 8 years. In his sales activities he has worked throughout the United States.

Mershon Named Sales Head By Southwest Industries

Jack L. Mershon has been appointed sales manager for Southwest Industries, Inc., in the area of Oklahoma, Colorado, Wyoming, Kansas, Nebraska, and Arkansas. Southwest Industries, Houston, is a manufacturer of packaged gas compressors using Cooper-Bessemer compressors.

Mershon was employed by Stone & Webster Engineering Corp. in 1947 as assistant field superintendent, supervising installation of mechanical process equipment. After a year with Stone & Webster he joined Manila Electric Co. and spent 3 years in the Philippine Islands as assistant power superintendent. When he returned to the United States he served as a consultant on small petroleum process installations for 1½ years before joining Refinery

Fluid Packed Pump Builds Raw-Material Warehouse



As a part of its current $750,000 plant-expansion program, Fluid Packed Pump Co., manufacturer of Oilmaster down-well pumps and production equipment, has completed a new raw-materials warehouse at its Los Nietos, Calif., plant. This picture shows part of current stock of 1,000 tons (40 carloads) of steel-tubing material.

NOW! An Entirely New Method For Sizing Controls!

BS&B's New, Exclusive Method Takes Both The GUESS And The WORK Out Of Controls Sizing For Liquid, Steam And Gas Applications!

Today's modern and complex processing systems require accurate control valve sizing. No one has recognized this fact more than BS&B.

Therefore, as a service to industry, BS&B set out to develop a new, simple, more accurate method of sizing controls. Here it is in the new BS&B Controls Sizing Manual.

This new, exclusive method uses two new "tools" to make sizing more accurate—the SIZE-O-GRAPH to determine what the valve MUST do and Cv RATINGS to determine what the valve WILL do.

These "tools" are based upon thousands of hydraulic flow tests performed on all sizes and types of BS&B Controls in the industry's largest and most modern flow testing laboratory. Results are proven by correlation with *actual* gas and steam flow tests.

If you'd like a copy of this new manual, write to . . .

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Controls Division, Dept. 4-A2.
7500 East 12th Street, Kansas City 26, Missouri

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SEVEN WAYS CONTROL-FRAC

1 **GREATER FRACTURING ECONOMY** is yours with Western CONTROL-FRAC, a newly developed Western fracturing fluid providing real effectiveness at less cost. Made from lease crude or any partially refined oil, it provides control over fluid-loss rate and control over viscosity. Being custom-designed for each individual well, it gives the effectiveness you have asked for in an ideal fracturing fluid. And because of the controls, CONTROL-FRAC brings you a new economy in oil and gas well fracturing.

2 **GREATER RADIUS OF FRACTURE** is possible with CONTROL-FRAC because of the control over rate of fluid-loss. Since the loss of fracturing fluid to the porosity and permeability of the formation is rigidly controlled, essentially the entire fluid volume is available to extend fractures deeper into your pay zone for sustained higher rate of production.

3 **CONTROLLED VISCOSITY IN CONTROL-FRAC** provides better sand dispersal in the fractures. As the controlled viscosity is virtually unaffected by bottom-hole temperature, sand is carried into the deepest fractures regardless of injection rate. The deeper fractures will not heal when treating pressures are released. CONTROL-FRAC contains an internal breaker for assured fast clean-up.

4 **FEWER PUMPS ARE REQUIRED WITH CONTROL-FRAC.** Control over fluid-loss rate and over viscosity reduces need for high injection rates. This means you can now get superior fracturing results with less pumping cost. And with the reduced need for high injection rates, expense of pulling tubing can be eliminated if desired.

THE

GENERAL OFFICES: MIDLAND, TEXAS

TEXAS: Ballinger, Borger, Levelland, Odessa, Seagraves, Snyder, KANSAS: Ulysses; NEW MEXICO: Hobbs; OKLAHOMA: Healdton, Cushing.

Step in Fracturing-

GREATER ECONOMY

FLUID LOSS CONTROL

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FEWER PUMPS

LESS FRAC OIL

LEASE CRUDE BASE

OUTSTANDING RESULTS

ANSWERS FRACTURING NEEDS

5 **USE LESS FLUID WITH CONTROL-FRAC.** Again the control over fluid-loss rate brings you a distinct advantage in that the need for large volume treatments is reduced. Less fluid means less cost . . . less cost for the fluid itself, less cost for pumps, less costly clean-up time.

6 **USE LEASE CRUDE** to make **CONTROL-FRAC.** With crude from your lease as the base for CONTROL-FRAC you have a less expensive fracturing fluid, a fluid readily available, readily saleable and fully compatible. Here again CONTROL-FRAC brings you better . . . more effective fracturing with true economy.

7 **OUTSTANDING RESULTS WITH CONTROL-FRAC** are shown in actual on-the-job performance records. 30- and 60-day tests after CONTROL-FRAC treatments show generous production increases such as 4- to 120-BOPD; 6- to 90-BOPD; 35- to 120-BOPD; 6- to 90-BOPD. Similiar outstanding successes are noted in new completions. And these results can be yours with as much as 50% cash savings in treating cost!

WRITE FOR CONTROL-FRAC LITERATURE . . .

. . . Watch for another Western announcement . . soon.

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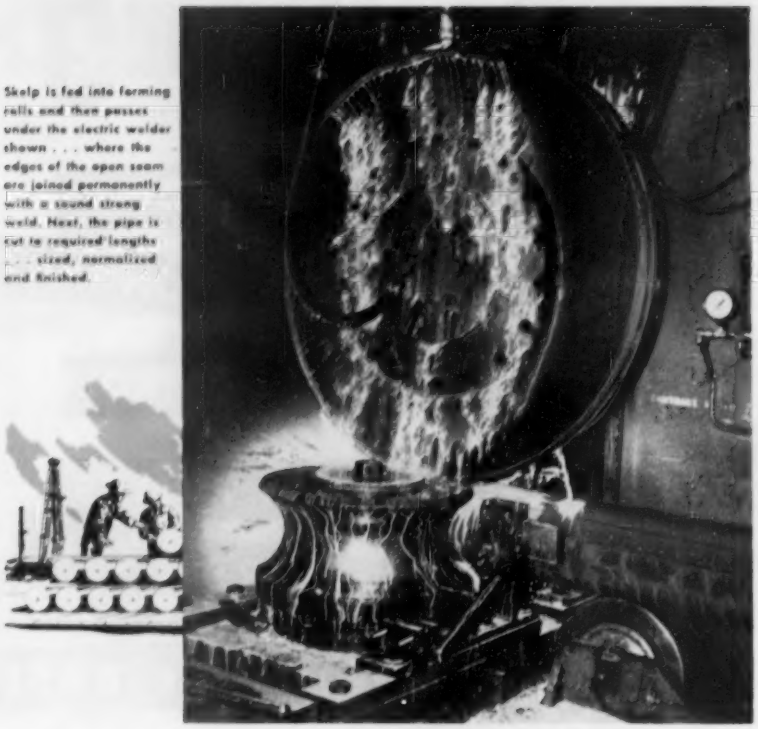

Skelp is fed into forming rolls and then passes under the electric welder shown . . . where the edges of the open seam are joined permanently with a sound strong weld. Next, the pipe is cut to required lengths . . . sized, normalized and finished.

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Engineering Co. He resigned from Refinery Engineering to join Southwest Industries.

Consolidated Names Walker To Its Systems Division

J. K. WALKER

In answer to demands of chemcal, petrochemical, and petroleum industries for entire systems of automatic-process control equipment, Consolidated Engineering Corp., Pasadena, Calif., has appointed an expert on chemical instrumentation to its systems division.

Jack K. Walker, manager of the firm's analytical instrumentation group since 1953, has been transferred to the systems division as project chief for process control systems.

Commenting on Walker's appointment, Kennet W. Patrick, systems division director, stated that the process industries are becoming increasingly interested in translating information involving process measurement and analysis into a form in which it can be used for automatic control of refining operations or production of chemical and petrochemical products.

Prior to joining Consolidated Engineering in 1952 as manager of the firm's analytical service department, Walker was senior physicist for Socony-Vacuum Oil Co., Inc., in Paulsboro, N. J., and chief chemist for Triplette & Barton in Wichita, Kans.

Clark Bros. Co. Opens Atlanta District Office

R. FOSTER

Clark Bros. Co., Olean, N. Y., has announced the opening of a new district sales office in Atlanta. Manufacturers of heavy-duty engines, compressors, and gas turbines for the petroleum, gas, process, and general industry, the office was established to better serve industry in this rapidly expanding new territory.

Opening the new Atlanta office and acting as district manager of the territory is Richard Foster. Foster possesses a wealth of experience in the heavy-machinery field with particular emphasis on the oil, gas, and refrigeration industries.

Prior to joining the staff of Clark Bros. in 1945, he had accumulated 16 years of experience in the turboma-

What's behind Mission products in the field?

Nothing but the finest will ever bear the name of

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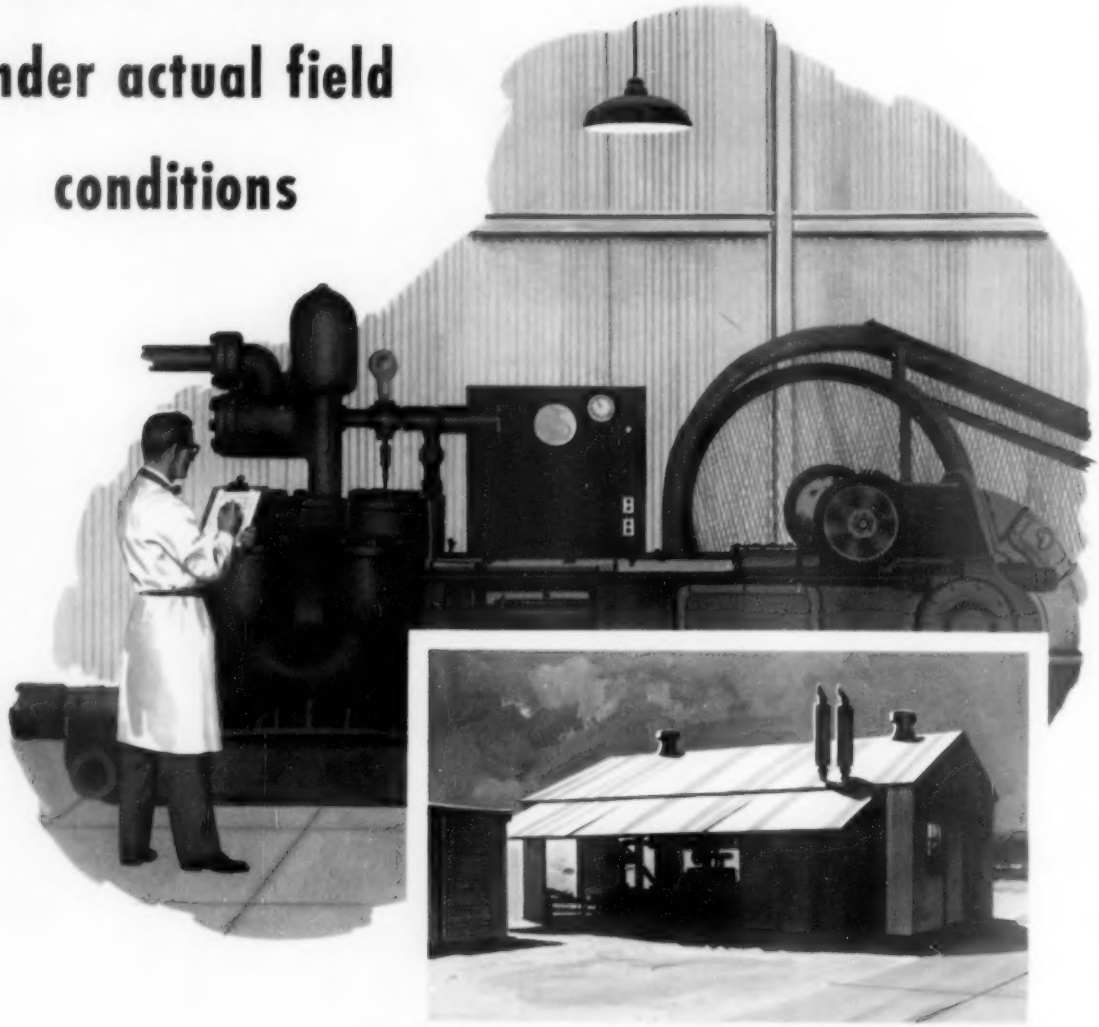

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Export Office: 30 Rockefeller Plaza, New York

A test pump simulating actual field conditions operates 24 hours a day on automatic controls at the Mission plant in Houston testing fluid end slush pump parts to assure their dependable performance in the field. This test set-up, housed in a special building, includes a 7½ x 14 standard oil field pump powered by a 450 HP gas engine and has a standard size mud pit using old mud taken from field pits containing cuttings and high sand content. The unit operates at temperatures up to 140° and at pressures in excess of 1500 pounds with all parts being subjected to severe operating conditions during each test.

This thorough and continuing program of testing Mission parts is your assurance that "nothing but the finest will ever bear the name of Mission." Specify Mission fluid end slush pump parts for high quality and dependable performance. Available through all supply stores.

chinery field. At Clark he acted as the sales manager of the turbomachinery division for 7 years. During the past 2 years, Foster has been engineering sales manager for the entire Clark line of products.

General Controls Names Walters Regional Manager

W. K. WALTERS

General Controls Co., Glendale, Calif., manufacturers of automatic controls, has named W. K. Walters as regional manager of the company's branch office in Houston, it has been announced by J. F. Ray, vice president in charge of sales.

In addition to his technical training, Walters has had selling experience, including 3 years with Minneapolis-Honeywell Regulator Co. as a sales engineer.

Ehrhart & Arthur Shift Sesler to Oakland, Calif.

Ehrhart & Arthur, Inc., Engineers and Constructors, have transferred Frank E. Sesler to Oakland, Calif., as manager of San Francisco Bay area activities. Sesler been with the firm for 6 years as a project engineer and has a 15-year background of consulting engineering, construction work on refineries, chemical plants, and pipelines.

Dunham Tanks Appoints Wilson General Manager

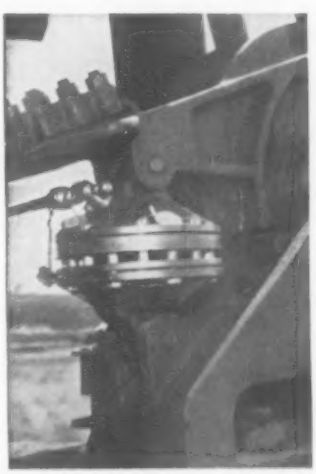
Sam A. Wilson has been named general manager of Dunham Tanks, it has been announced by Ted Dunham, president of Anderson-Dunham, Inc., parent company located in Baton Rouge, La.

Wilson's background has been full of diversified and valuable experience. From 1938 to 1944 he was affiliated with National Tank Co. For the next 2 years he worked for J. B. Beaird. In 1946, Wilson moved to Maloney-Crawford Tank & Manufacturing Co., where he stayed until his recent assignment as general manager of Dunham Tanks.

The plant and offices of Dunham Tanks are located in Minden, La. This company manufactures a complete line of tanks and tank equipment.

THIS IS THE LAST WORD IN WEIGHT-INDICATOR ACCURACY

Martin-Decker's new Sensater gives you friction-free weight indication



The E-80 Sensater is a new kind of *diaphragm* pressure transformer. It doesn't deflect, but moves with its backing plate. The slightest movement of your Ideal Wire Line Anchor creates a piston-like stroke, without a friction-causing piston-rod or packing.

With the new ultra-perceptive Sensater, your Martin-Decker Type "D" or "E" Weight Indicator becomes a more valuable tool than ever for such precision jobs as fishing, milling, cutting, and coring — a small investment to increase the life of diamond bits and other costly equipment making up a half-million-dollar drilling rig.

The big color-keyed indicator dial instantly tells you the accurate weight of the drill string and the net weight on bit in thousands of pounds. Included is a vernier, sensitive to minor weight changes.

Martin-Decker's familiar red box is packed with valuable drilling information. The instrument panel includes a weight indicator, mud-pressure gauge, rotary torque gauge, draw-works speed selector, rotary-table tachometer, and a vapor-proof light. On the back is a 24-hour recorder with pens for weight, mud, and torque. Martin-Decker engineers will work out other instrument combinations for your special drilling requirements.

For further information ask for Bulletin P-10. Write: Martin-Decker, 3431 Cherry Ave., Long Beach 7, California, Dept. D-1.

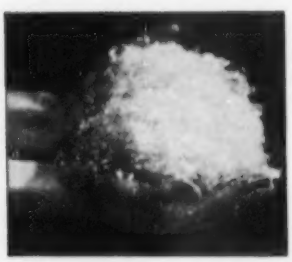
DISTRIBUTORS: T. C. Cullen, Bakersfield, California; Reed Roller Bit Co., Houston, Texas; Reed Roller Bit Co. of Canada, Ltd., Calgary and Edmonton, Alberta. Martin-Decker Weight Indicators and Ideal Wire Line Anchors are also sold through The National Supply Co., The National Supply Co. Export Division and other recognized supply houses.

MARTIN-DECKER CORP.

HOME OF THE WEIGHT INDICATOR — LONG BEACH, CALIFORNIA

JELFLAKE

Lost circulation regained or prevented in drilling wells with DOWELL fragmented plastic



Jelflake®—Dowell's thin, fragmented plastic foil—is widely used in the oil field to prevent or regain lost circulation in drilling wells and in cementing operations.

For example, a thief zone was expected between 10,000 and 10,400 feet in a drilling well. Just above this depth, a small amount of Jelflake was added to the drilling mud. The well was completed without loss of circulation.

The graded particles of Jelflake are designed to work two ways: (1) The smaller sized flakes penetrate formation pores to plug them. (2) The larger pieces plug and plaster themselves over the formation face to form an impervious filter cake.

The contents of one 25-pound bag of Jelflake can cover over a half-million square inches. Jelflake is easy to apply—through a hopper or at the mud hog suction. Its crinkled surface allows the particles to disperse readily into mud or cement.

Get your supply of Jelflake today at your mud distributors or at your nearest Dowell station. For more details on Jelflake and other Dowell oilfield products, write DOWELL INCORPORATED, Tulsa 1, Oklahoma, Dept. B-11.

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EXPLORATION

New Life Hits Balcones Fault Zone

by Frank J. Gardner

IN our recent annual number, the Journal's geologists made some predictions about the exploration picture for 1955. Naturally, a bit of trepidation was involved, for anyone who tries to forecast the turn of events in oil discovery is beating a drum made of his own skin.

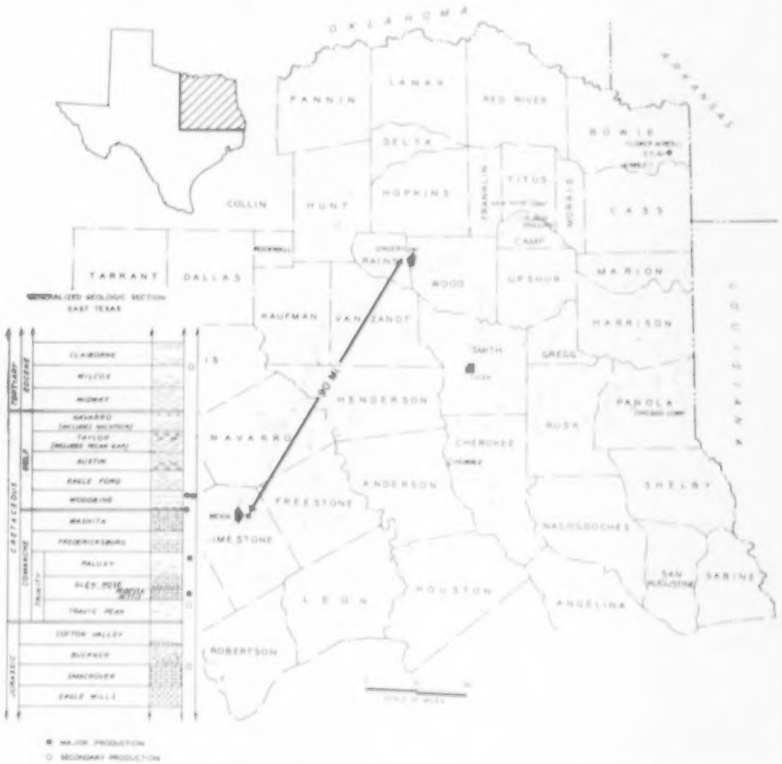
A buried prediction . . . But buried among other predictions was one that forecast a "flurry of wildcats along the Balcones fault zone." Now, as in all forecasts, there was some sound basis for the prophecy. Too many oil men were poking into old files, dusting off dingy maps, and asking questions about old fields. The "frac fever" had hit East and Central Texas. Every sign pointed to a new play all the way from San Antonio to Texarkana.

It's coming true. Along the old fault line in Caldwell, Guadalupe, and Wilson counties, some 300 new locations have been staked since January 1, and about 125 oil wells have been finished.

Most of these are shallow wells to the Navarro and Austin formations, at depths of 750 to 2,500 ft. Tests are announced, drilled, and completed in rapid-fire fashion, and the trend is as hot as it ever was in the '20's. Nostalgic names that smell of oil are in the news again—Luling, Darst Creek, Salt Flat . . . and Mexia.

And a deep discovery . . . Mexia today means magic—deep magic. Here, at the southern end of one of Texas' oldest fault fields, Humble Oil & Refining Co., has found good flowing oil production from the Jurassic-Smackover at 8,565 ft. This is not the first time the Smackover has produced in Texas, but it's the first time the formation has given such good promise for the future.

Nearly a hundred miles southwest of any other Smackover strike, Humble's 1 Joe Ross heirs, on a drill-stem test at 8,565-76 ft., flowed 232 bbl. per day of 50° oil in a 24-hour period, using ¼-in. choke. Operators found the Smackover about 3,300 ft. shallower than it was found at Ginger and New Hope fields to the northeast (see map). This gives a lot of impetus to the belief that good Smackover production at moderate depths can be found all the way to the Sabine uplift if sufficient structural factor exists.

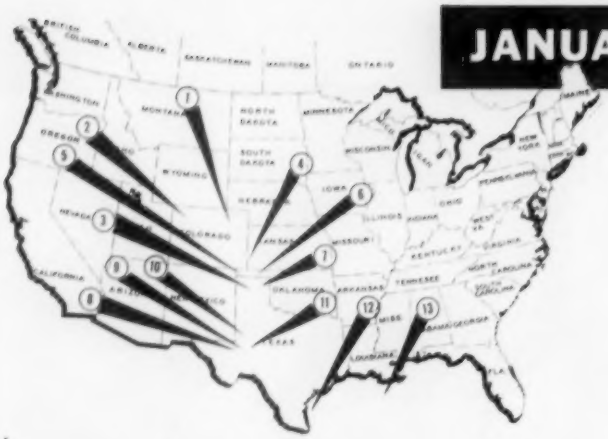


Smackover discovery at old Mexia field (arrow) is expected to open a new era in East Texas. Other active Smackover wildcats are indicated on the map by operators' names.

Indicate a new era . . . Humble's test at once set off a lively leasing campaign all over the East Texas area, especially along the Mexia-Talco fault line. No doubt, the discovery opens a new prospecting era for the northeastern quarter of the state—an era of ever-deeper drilling toward the lower Mesozoics at depths of 20,000 ft., and more. Some sources contend that it's the most important strike since 1930. It may well be, geologically. For the past few years, the riddle of Smackover promise has puzzled and disappointed East Texas operators.

Only four fields have tapped the formation—three for gas, condensate, or both, and one for oil. At Ginger field (Rains County), the gas produced carried an unusually high sulfur fraction, and development has lagged. New Hope field (Franklin County) was a great encouragement to the Smackover search in 1954, when Tide Water Associated Oil Co. finished its 1 Ramey Unit for 608 bbl. of condensate per day plus 3,829 M.c.f. of gas, but production came from a deep 12,096 ft. Flower Acres, in Bowie County, was found in 1946 by a small gas-condensate well, but it too proved disappointing. At Eylau in the same county, the only Smackover oil field, the discovery well was offset by four successive dry holes. The field is still producing about 1,500 bbl. a month from the lone well.

This discovery at Mexia bears out the belief of many geologists that the East Texas basin and the bordering fault zones have a lot to offer to the wildcatter. The lagging interest of recent years has not been due to a shortage of prospects. Greener pastures in other states have lured the prospector away. Perhaps the magic of Mexia and the flurry along the faults will spark his interest in this oldest of Texas oil arenas.



JANUARY'S SUCCESS TALLY

Rocky Mountain Province

1. Productive limits of the Denver-Julesburg basin extended north, east, and south.
2. Gas exploration stepped-up in northwest Colorado.

Hugoton Embayment Province

3. First oil production established in North Hutchinson field.
4. Hamilton County became Kansas' seventy-third oil-producing county.
5. Camrick field jumped into big new expansion year.
6. Oklahoma Panhandle interest shifted to Beaver County.
7. Hansford County, Texas Panhandle, due for busy year.

West Texas Province

8. Pecos County wildcat set new drilling-depth record for Texas.
9. Major Devonian strike brightened Winkler County's prospects for 1955.
10. First Devonian oil for Midland County part of Headlee field established.
11. Dora Roberts field continued growth.

Gulf Coast Province

12. Texas offshore drilling scored another well near Padre Island.
13. Shell Oil Co. bagged 1955's first offshore hit of importance in Coastal Louisiana.

January Drilling Sets Swift Pace

by John C. McCaslin

THE curtain has gone up for the first act of 1955 exploration. Four geologic provinces played the leading roles in January's contribution to what is expected to be a significant year for the industry. The Denver-Julesburg basin in the Rocky Mountain province took the lead early in the month. This area's developments were supported by newsmakers in the Hugoton embayment, West Texas, and the Gulf Coast of Texas and Louisiana.

The D-J story . . . Not satisfied with its best year in history in 1954, the Denver-Julesburg basin stepped to the middle of the January exploratory stage.

A quick succession of three discoveries in far-removed sectors of the basin in January stretched the productive limits of D-J in three directions . . . north, east, and south. All three discoveries were about as remote as is possible from other production. Here's a quick rundown of their significance.

Way up in the far northwestern corner of the basin, almost to the Hartville uplift itself, F. R. Anderson and Great Basins Petroleum Co. opened first oil production in Goshen County, Wyoming. Their Airport discovery is 40 miles northwest of nearest oil at Harrisburg field in Nebraska. The Dakota "J" sand strike has revived interest in the Wyoming portion of the basin . . . a too-long-forgotten region.

Down near the bottom of the basin, 22 miles south of previous production, Sinclair Oil & Gas Co. established first oil production for Elbert County, Colorado, at a small Dakota sand test. Except for ancient Canon City-Florence field production, the 1 Bradbury is the basin's southernmost oil.

Eastern Denver-Julesburg basin exploration received a boost at Thompson & Oliver's 1 Warren Dakota oil discovery, 28 miles east of previous basin oil. The wildcat pushed the basin's productive limits almost to the edge of Yuma County.

They're off at Hugoton . . . Hugoton embayment drilling shows no sign of letting up in 1955. Pre-Permian discoveries, extensions, and new pays in January have set the stage for another big year.

North Hutchinson field in Hutchinson County, Texas Panhandle, is promised oil production on the basis of tests in the Marmaton lime. The Texas Co. reported an estimated potential of 2,000 M.c.f. of gas plus 3 bbl. of oil per hour from perforations in the Marmaton at 1 Harbour. The well opened first oil production in the five-well gas field.

Last year's rapid expansion of pre-Permian production in northeastern Hansford County moved into 1955 with even bigger promise. The Panhandle county is well dotted with drilling wells and locations. Last year furnished some real wildcat news in Hansford. It appears that 1955 activity will overshadow the 1954 success.

An important turn of events in the

Total January Completions, Exploration and Development

	Total completions					Total wildcat wells					Active
	Total	Oil	Gas	Dry	Footage	Total	Oil	Gas	Dry	Footage	operations
Alabama	5	0	0	5	23,472	5	0	0	5	22,966	9
Arkansas	37	23	1	13	146,852	11	3	0	8	46,907	57
California	205	149	4	52	1,008,067	37	3	1	33	224,301	213
Colorado	105	23	7	75	570,087	59	4	3	52	318,103	90
Florida	8	0	0	8	54,634	7	0	0	7	43,009	2
Illinois	401	238	0	163	1,004,639	54	10	0	44	123,906	445
Indiana	60	18	4	38	89,927	18	2	0	16	25,699	72
Kansas	390	193	25	172	1,364,813	86	8	2	76	332,705	469
Kentucky	121	54	12	55	208,339	25	6	1	18	37,380	153
Louisiana	348	230	28	90	2,142,901	52	19	4	29	493,485	408
North	185	133	18	34	534,511	15	4	1	10	81,136	152
South	163	97	10	56	1,608,390	37	15	3	19	412,349	256
Michigan	56	17	3	36	163,091	25	1	0	24	78,605	112
Mississippi	34	14	0	20	256,018	12	0	0	12	88,532	54
Montana	31	16	0	15	158,585	10	1	0	9	54,871	69
Nebraska	49	18	0	31	264,171	26	3	0	23	132,433	56
New Mexico	76	44	14	18	345,490	9	0	0	9	39,484	137
Northwest	13	0	10	3	43,552	2	0	0	2	8,593	19
Southeast	63	44	4	15	301,938	7	0	0	7	30,891	118
New York	20	10	0	10	29,000	0	0	0	0	0	11
North Dakota	14	11	0	3	104,728	3	0	0	3	18,110	26
Ohio	89	35	22	32	194,163	6	0	2	4	27,072	189
Oklahoma	578	355	22	201	1,905,457	62	7	2	53	267,385	1,069
Pennsylvania	53	16	22	15	152,666	3	0	3	0	15,607	67
South Dakota	1	0	0	1	4,010	1	0	0	1	4,010	5
Texas	1,515	961	56	498	6,801,845	390	64	12	314	1,918,078	1,249
North Central (7-B & 9)	460	280	0	180	1,474,712	138	25	0	113	517,274	303
West (7-C & 8)	386	302	1	83	2,096,979	77	12	1	64	407,118	453
Panhandle (10)	87	61	18	8	280,621	2	0	1	1	9,749	53
East (5 & 6)	98	39	7	52	492,236	34	3	0	31	160,645	76
Gulf Coast (2 & 3)	238	121	18	99	1,547,275	76	10	7	59	555,476	175
Southwest (1 & 4)	246	158	12	76	910,022	63	14	3	46	267,816	189
Utah	5	1	0	4	32,508	4	0	0	4	26,701	24
West Virginia	57	10	40	7	87,106	2	0	2	0	6,836	180
Wyoming	84	50	1	33	451,013	18	1	1	16	100,194	130
Miscellaneous	¶2	0	0	2	14,135	¶2	0	0	2	14,135	§14
Total January 1955	4,344	†2,486	261	*1,597	17,577,717	927	‡132	33	762	4,460,514	5,310
Total December 1954	5,016	2,743	355	1,918	20,134,971	1,110	154	40	916	5,278,611	5,368
Total January 1954	4,706	2,599	330	1,777	19,597,883	970	136	25	809	4,664,851	4,429
Western Canada	214	152	13	49	945,600	59	16	8	35	299,536	
Alberta	129	93	13	23	678,644	37	10	8	19	219,462	
Saskatchewan	47	27	0	20	170,896	13	2	0	11	56,320	
Manitoba	35	30	0	5	88,343	6	2	0	4	16,037	
B.C.-N.W.T.	3	2	0	1	7,717	3	2	0	1	7,717	

*Incl. 52 service wells: Ky. 1, N. Y. 10, Pa. 13, Ohio 7, Okla. 20, Tex. (Dist. 3) 1. †Incl. 47 condensate wells: N. La. 2, S. La. 14, Miss. 1, N. M. 1, Okla. 3, E. Tex. 1, Gulf Coast 17, S.W. Tex. 8. ‡Incl. 6 dist. discoveries: N. La. 2, S. La. 4 §Incl. Wash. 2, Mo. 4, Tenn. 1, Ariz. 2, Idaho 1, Nev. 4. ¶Incl. Nev. and Wash.

Oklahoma Panhandle is the shifting of interest to Beaver County. A prolific trend of Morrow and Mississippian gas-distillate production is shaping up through the entire width of the county. This trend has one anchor in the northeast corner of the county, and the other in the Light field area. Beaver County is a spot to watch in 1955.

New West Texas record . . . Hunt Oil Co. set a new Texas drilling-depth record at 47 Elsinore, 18 miles southwest of Fort Stockton in Pecos County.

The wildcat is an Ellenburger test. Nearest Ellenburger production is about 30 miles east at Puckett field. Total depth of the new record holder for the state is 18,673 ft. The previous deep hole was Gulf 1 Northrup in Reeves County. That well passed the 18,600-ft. mark before quitting.

Winkler is back . . . A possible major Devonian oil strike in North Monahans field, Winkler County, has brought up the prospects of a possible trend between this area and the 1954 Ellenburger discovery in Emperor field, 10 miles northwest.

Stanolind Oil & Gas Co. 20 Sealy Smith Foundation had an indicated Devonian pay zone of 160 ft. Top of the Devonian is about 1,300 ft. higher than a dry hole 2 miles to the east.

Other West Texas developments included the establishment of first Devonian oil in the Midland County sector of Headlee field. Offset and extension work at Dora Roberts Ranch field continued with good success.

Offshore hits . . . Standard Oil Co. of Texas made its third successive strike near Padre Island off the coast of Texas. Stanotex, which made the first discovery in the Texas tidelands, still has the only oil production in the area. Seven other firms are drilling in the area now with others scheduled to begin shortly.

Shell Oil Co. made the year's first oil discovery in the waters off Louisiana at a South Pass Block 6 well in Plaquemines Parish, near the mouth of the Mississippi River. The discovery is the first success in the offshore area southeast of the river passes.

South Pass Block 20 field, 10 miles off Terrebonne Parish in the Gulf of Mexico, got its first oil production at Magnolia Petroleum Co. 2-A State Lease 793.

The well, in Block 19, east of the field's two shut-in gas wells, flowed at the rate of 818 bbl. of 35°-gravity oil per day through 5/32-in. choke. Completion was in sand at 10,274-90 ft. The two gas wells in the field, completed in 1951, are in an 8,100-ft. sand.

The California Co. has a new oil discovery in West Delta Block 30 field, 8 miles off Plaquemines Parish in the

RUGGED-VERSATILE-

These pictures are of an SSC "Track-mounted" Seismic Crew on assignment in one of the semi-swamp areas of the U.S.A. The crews basic units are a tractor-mounted auger-type Drill, a tractor-powered Recording Unit and a Shooting Unit.

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WORLD-WIDE EXPERIENCE

Total Depth Classifications, January 1955

	A 0-1,250 ft.	B 1,250-2,500 ft.	C 2,500-3,750 ft.	D 3,750-5,000 ft.	E 5,000-7,500 ft.	F 7,500-10,000 ft.	G 10,000-12,500 ft.	H 12,500-15,000 ft.	I Over 15,000 ft.
Alabama	1	0	1	0	3	0	0	0	0
Arkansas	0	8	12	5	12	0	0	0	0
California	18	35	27	47	42	24	7	4	1
Colorado	0	2	1	27	73	2	0	0	0
Florida	0	0	1	2	3	0	2	0	0
Illinois	31	123	241	6	0	0	0	0	0
Indiana	31	18	11	0	0	0	0	0	0
Kansas	3	33	218	127	9	0	0	0	0
Kentucky	51	42	22	6	0	0	0	0	0
Louisiana	9	125	15	8	45	64	52	25	5
North	7	123	13	4	26	12	0	0	0
South	2	2	2	4	19	52	52	25	5
Michigan	7	20	10	15	4	0	0	0	0
Mississippi	0	0	0	4	16	9	5	0	0
Montana	0	4	5	10	5	7	0	0	0
Nebraska	0	1	6	9	33	0	0	0	0
New Mexico	5	9	23	18	10	3	7	1	0
Northwest	0	6	3	1	13	0	0	0	0
Southeast	5	3	20	17	7	3	7	1	0
New York	0	20	0	0	0	0	0	0	0
North Dakota	0	0	1	1	2	10	0	0	0
Ohio	28	20	36	2	3	0	0	0	0
Oklahoma	45	175	197	67	60	25	9	0	0
Pennsylvania	14	29	9	0	0	1	0	0	0
South Dakota	0	0	0	1	0	0	0	0	0
Texas	108	294	307	253	327	167	45	14	0
North Central	59	138	101	87	71	4	0	0	0
West	9	42	69	77	116	36	23	14	0
Panhandle	0	6	72	6	2	1	0	0	0
East	8	10	8	30	26	15	1	0	0
Gulf Coast	6	11	23	29	65	88	16	0	0
Southwest	26	87	34	24	47	23	5	0	0
Utah	0	0	0	2	2	0	1	0	0
West Virginia	1	30	15	9	2	0	0	0	0
Wyoming	5	4	14	15	29	15	1	1	0
Miscellaneous	0	0	0	1	0	0	1	0	0
Total January 1955	357	992	1,172	635	680	327	130	45	6
Western Canada	1	43	48	32	72	15	3	0	0
Alberta	1	5	20	19	66	15	3	0	0
Saskatchewan	0	17	12	12	6	0	0	0	0
Manitoba	0	19	16	0	0	0	0	0	0
B.C.-N.W.T.	0	2	0	1	0	0	0	0	0

Gulf of Mexico. It is 1-A State Lease 1069, completed in sand at 8,186-8,222 ft. with a flow rate of 232 bbl. of oil per day on 9/64-in. choke.

This is the second oil discovery for the field this year. Earlier in the month Humble Oil & Refining Co. completed a good producer in a deeper sand at 8,733-50 ft. Previously the field had only two shallow-sand gas wells, both shut in. The first was finaled in 1949. Two dry holes have been drilled.

EXPLORATION HIGHLIGHTS

MID-CONTINENT

KANSAS

Nomenclature Committee Gives New Pools Names

At the regular monthly meeting held in Wichita the Kansas Nomenclature Committee recommended names for 11 new fields in Kansas. Seven of the new pools were on the Central Kansas uplift; one new pool was in far western Kansas' Hugoton embayment area, and two in the Sedgwick basin plus one in southern Kansas completed the agenda.

On the uplift in Barton County Northeast Claflin pool was opened at Fransis Raymond 1 Preager, NE NE NE 3-18s-11w, as a Lansing producer. Also in Barton Skelly Oil Co. 1 Woodmansee "A," SE NE SE 21-18s-13w, opened West Homestead pool with Arbuckle production at 15 bbl. of oil per day.

In Ellis County Southwest Toulon pool was opened at Lebon Oil Co. 1 Dinkle, SE SE NW 16-14s-17w, for 26 bbl. of oil per day from the Arbuckle. Pawnee County got two new pools. West Garfield pool was opened at Sterling Drilling Co. 1 Stroebel "A," NE NE NE 3-23s-18w, with Pennsylvanian conglomerate production. Bay Petroleum Co. 1 Carpenter "A," NW SE NE 25-23s-17w, is a Penn-Miss discovery, opening Carpenter pool.

West Coats pool was opened in Pratt County with the completion of a shut-in gas well at Lario Oil & Gas Co. 1 Chastain, NW SW NW 24-29s-14w. The well potentialed for 2,485 M.c.f. of gas per day from the Lansing. Morrison Drilling Co. opened Rothe pool in Rush County for 4,000-5,000 M.c.f. of gas per day from the Lansing. The well is in SE NE NW 31-17s-16w.

In the Sedgwick basin Cities Service Oil Co. 1 Voran, SE SW NE 27-29s-7w, Kingman County, opened Trenton pool with 1,047 M.c.f. of gas per day from the Mississippian. In Sumner County South Texas Development Co. 1 Kerschen, SW NW NW 17-31s-3w, is in completion stages from the Lansing, opening Kerschen pool.

Cowley County in southern Kansas has a new pool at Burden townsite. It is Ashton Oil Co. 1 Henderson, NW SW SE 34-31s-6e. The well completed for 17 bbl. of oil per day from the Layton.

Hamilton County got its first oil pool at United Producing Co. 1 Helfrich, C SE SE 6-25s-42w. The well

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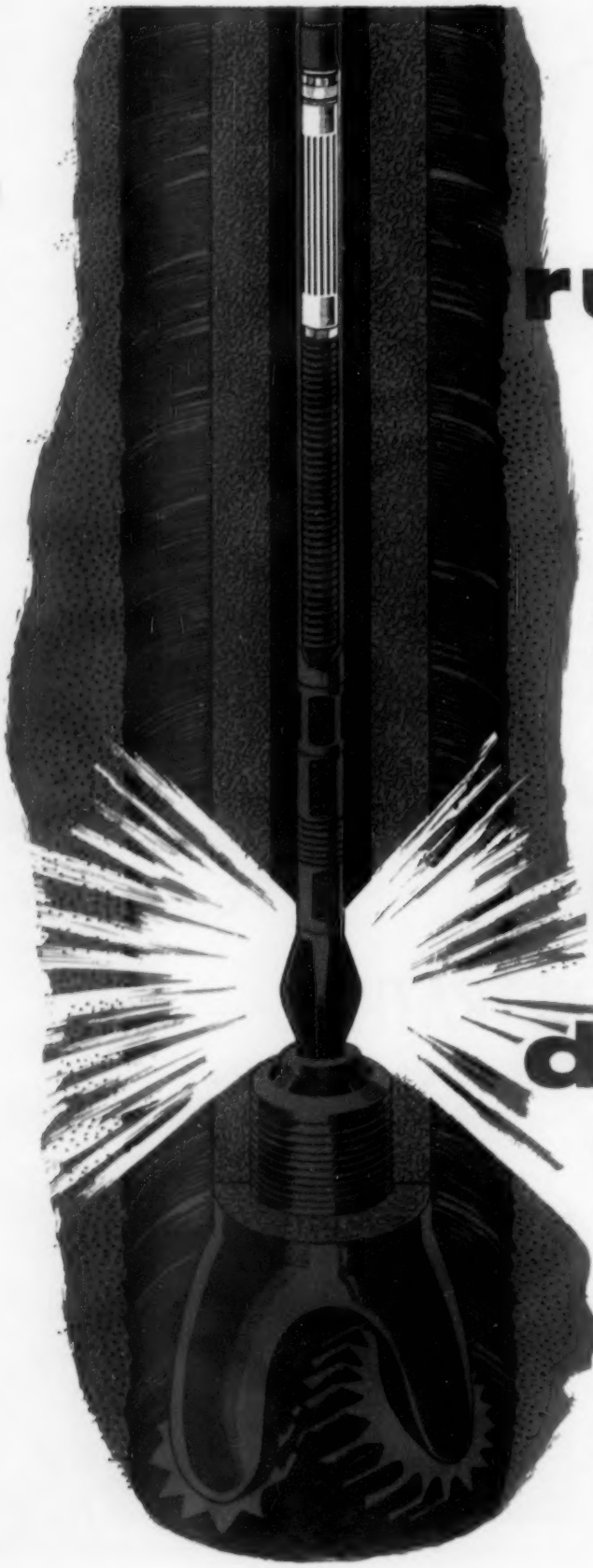

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completed for 50 bbl. of oil per day from the Morrow sand. It opened Helfrich pool.

Casing Cemented at Sedgwick County Test

Shawver & Armour, Inc., have set casing at 3,174 ft. on the 1 Hunt "B," SW SE NW 31-28s-1e, Sedgwick County.

Production will be attempted from the Mississippian dolomite topped at 3,174 ft. (—1,903 ft.). The discovery is ½ mile west of Hunt, NE SW NE 31. This well completed for a potential of 1,030 bbl. of oil per day from the Mississippian dolomite topped at 3,185 ft. (—1,914 ft.). Success at the Hunt "B" would extend production in Gladys pool 6 miles to the south.

Pawnee County Wildcat Produces From Conglomerate

Sunray Oil Corp. has completed its 1 Strobel, NE NE NW 18-23s-17w, Pawnee County, Kansas, as an oil producer at the rate of 439 bbl. per day. Sunray's new well on a 160-acre lease is an exploratory step out test approximately ½ mile from production in Garfield pool.

The oil is being produced from conglomerate chert at 4,251-59 ft. The total depth of the well is 4,420 ft. and a pumping unit will be set.

During the past 12 months Sunray has maintained an active lease play in following the trend toward the southwestern and western part of the state. Heavy checkerboard spreads were obtained in Kingman and Harper counties, two of the state's most active counties for new discoveries. As a result of stepped-up exploratory drilling, new producing leases were discovered in Graham and Rooks counties. Development drilling will be needed to define the limits of this new production. The development and extension of the Garfield pool in Pawnee County, Kansas, has brought Sunray acreage on both the north and south ends of the field into a development play which is planned for 1955.

OKLAHOMA

Wells Completed in Kay And Tillman Counties

Two oil well completions aggregating 557 bbl. per day of new production have been completed by Sunray Oil Corp. in Tillman and Kay counties, Oklahoma.

Sunray's 2 D. D. Alexander, NW 3-39-19w in Northwest Trimue field of Tillman County, flowed at a 413 bbl. per day rate through 12/64-in. choke, tubing pressure 610 pounds. The well is producing from the Strawn sand at approximately 5,000 ft. Sunray is starting to drill the third location on the lease.

In Kay County Sunray has completed its 4 State "F" SW 13-27n-1e, in Northwest Garrett field. Drilled to a total depth of 3,694 ft., Sunray's new well was Sandfraced in the Red Fork sand at 3,650 ft. and flowed at the rate of 144 bbl. of oil in 24 hours through 16/64-in. choke, tubing pressure 745 pounds.

Exploratory drilling on Sunray's "E" and "F" leases in Kay County during 1954 resulted in four new Red Fork sand wells on these leases. Other development drilling is in immediate prospect.

Lincoln County's Mount Vernon Pool Extended

A north extension discovery to Mount Vernon pool in Lincoln County, central Oklahoma, is indicated at The Texas Co. 1 Adams, SW SW NE 26-16n-3e.

The well recovered 1,100 ft. of oil on a test of the zone 4,162-71 ft.

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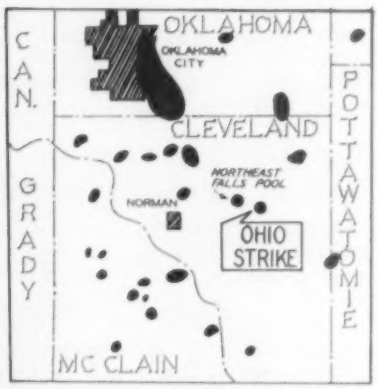
new Sweet Home pool well produced through perforations at 4,259-65 ft. in the Skinner sand.

Payson field . . . A new Skinner oil well was added to this Lincoln pool at Vierson & Cochran 4 Martin, NE SE SW 5-12n-5e. Pump is being installed after perforations in the Skinner sand at 4,093-4,118 ft. were treated to swab 5 bbl. of new oil per hour on an 18-hour test.

Second Wilcox Strike Seen for Cleveland Area



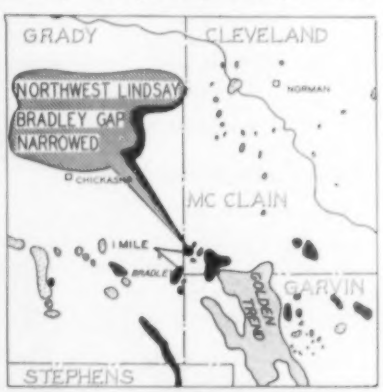
Ohio Oil Co. has an indicated Wilcox discovery southeast of Northeast Falls pool.

A new second Wilcox sand oil discovery is in the mill at 1 Heims, NW SE NE 27-9n-1w, southeast of newly opened Northeast Falls pool in Cleveland County.

The wildcat recovered 905 ft. of 35°-gravity oil on a drill-stem test at 6,970-92 ft. Operator is coring ahead at the indicated discovery.

Northwest Lindsay and Bradley Near Connection

The distance between McClain County's Northwest Lindsay field and Grady County's fast-growing Bradley-Bromide



The distance between Northwest Lindsay field and the Bradley-Bromide area has been cut to 1 mile.

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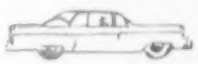

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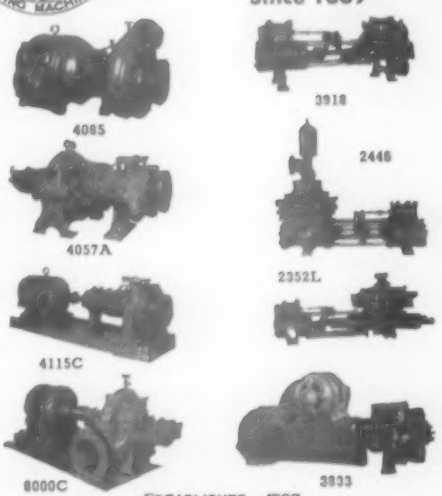

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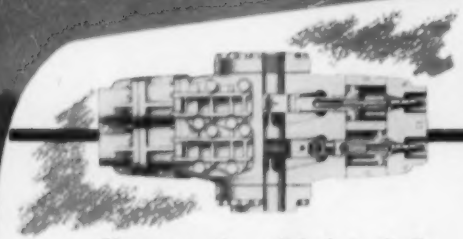

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If your operations call for *hydraulically*-operated cellar control gates, Shaffer Hydraulic Cellar Control Gates are—by all standards—unsurpassed in dependability, compactness and years-ahead operating features.

In addition, Shaffer Hydraulic Gates are available in both *Double* and *Single* types—whichever you prefer. Both incorporate the same advanced features, and parts are, in most cases, interchangeable between the two types, simplifying inventory and maintenance. Both types feature...

SIDE DOOR RAM CHANGES: To change rams, simply unbolt doors in the side of the Gate, change rams and bolt the doors shut again. It's by far the quickest, simplest method of changing rams—and in Double Gates, rams in the upper and lower compartments can be changed with equal simplicity. There's no need to dismantle the upper compartment to change rams in the lower compartment—or vice versa. Each compartment has its own doors—is equally accessible!

TRUE COMPACTNESS: There's no need to expand the length of Shaffer Gates—or leave extra room above them—in order to change rams. The doors open across the minimum dimension where there's plenty of room for convenient ram changes. Even in sizes as large as 13¾" (12" Series 900) Double Gates require a total height of only 30"—Single Gates only 18½"—overall (smaller sizes even less). Length and width dimensions are comparably compact!

COMPLETELY ENCLOSED DESIGN: No moving parts are exposed in Shaffer Gates—all are completely protected within the gate body. Nothing to become damaged or jammed by objects falling into the cellar, or corroded by chemical muds.

DIRECT HYDRAULIC DRIVE: Shaffer operating cylinders are *directly behind* the rams. For maximum safety there are no secondary connections or yokes between hydraulic cylinders and rams!

AND REMEMBER THIS IMPORTANT FACT... with Shaffer Hydraulic Gates you don't have to choose between one type for compactness—another type for maximum pressure protection. *The same basic Shaffer design combines BOTH maximum compactness and maximum pressure protection*—one more vital Shaffer advantage!

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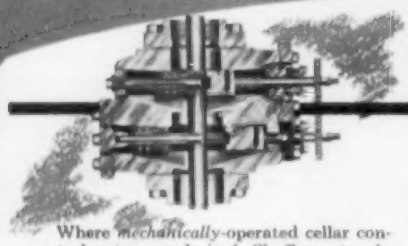

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SIMPLE RAM CHANGES: Only one end cover need be removed to completely change a set of Shaffer rams—and in Double Gates, each compartment is equally accessible without interfering with the other.

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sand producing area has been cut down to 1 mile by Sinclair Oil & Gas Co.

The 1 Wallace, C SW SE 18-5n-4w, McClain County, hit the Bromide third sand at 11,280 to 11,336 ft. The well flowed 490 bbl. of 48°-gravity oil in 12 hours through 18/64-in. choke natural. Tubing pressure is 2,050 psi., casing pressure 675 psi. The prolific well also flowed 4,890 M.c.f. of gas per day with a gas-oil ratio 4,990:1.

HUGOTON EMBAYMENT

SOUTHWEST KANSAS

Operator Has Set Casing At Second Kiowa Strike

Falcon-Seaboard Drilling Co. and Gulf Oil Corp. 1 Nichols, NE NE NW 20-29s-18w, 5½ miles south of Greensburg in Kiowa County, flowed 1,200 M.c.f. of gas per day on a drill-stem test of the Mississippian at 4,960-75 ft.

Another test got 3,200 M.c.f. per day. This is the second discovery on a 10,000-acre block by the two operators. The 1 Pyle, 13 miles to the southwest, pumped 305 bbl. of oil daily from the Mississippian on potential earlier this month. It opened Pyle field.

TEXAS PANHANDLE

First Flow Gage Reported at Panhandle Ellenburger Hit

The first Ellenburger discovery in the Texas Panhandle reported its first flow gage. Phillips Petroleum Co. 1-A Troy, Section 86, Block M-2, BS&F Survey, Gray County, made 175 bbl. of oil in 10 hours on 1-in. choke for the first hour of a test at 11,316-20 ft. The test was on ½-in. choke during the rest of the test. This flow rated 21 bbl. of oil. Gas volume was 1,450 M.c.f. per day with gas-oil ratio 2,877:1.

This important discovery, the biggest rank hit of the year anywhere so far, opens Ellenburger production in the Anadarko basin portion of the Texas Panhandle. Closest Texas Ellenburger production is more than 180 miles south.

OKLAHOMA PANHANDLE

The Beaver County Race Picks Up More Steam

Mocane field has a third producer testing as Beaver County's highly-active 100-sq. mile Mocane area gets busier by the day.

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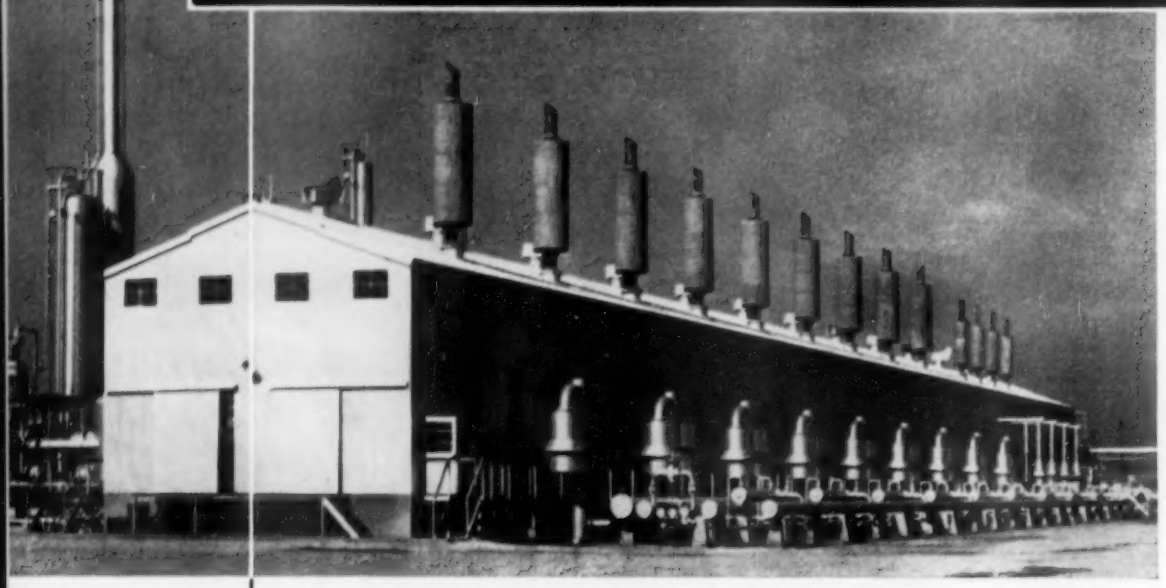

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SE NW 16-5n-25eCM, 1 mile southeast of the Mississippian discovery and 2 miles east of the Morrow discovery, is testing in the Mississipipan Chester at 6,993-7,025 ft.

To the southwest of this well 5 miles Cities Service Oil Co. 1 Miles "B," SE SE NW 12-4n-24eCM, a multipay hit, has more Morrow pay indicated. The well is also a Marmaton discovery and has indicated Oswego production.

A Mississippian discovery is assured 2 miles northeast of Southeast Mocane field at Pure Oil Co. 2 Dixon, NE NE SW 29-5n-26eCM. This strike is 1¼ miles southwest of Northwest Knowles field, a one-well area. The Dixon well flowed gas from the Chester and a small amount from the Morrow.

WEST TEXAS-NEW MEXICO

WEST TEXAS

Midland County Extension Reports Heavy Oil Flow

U. S. Smelting, Refining & Mining Co. 1-A Roy Parks, on the south side of Headlee field in Midland County, flowed 125 bbl. of oil in 1½ hours. The well was testing the Ellenburger from 13,175-13,250 ft., using 2,000 ft. of water blanket. On the test, gas surfaced in 36 minutes, water blanket in 55 and oil in 65 minutes.

Sample top on the Ellenburger was 13,075 ft., minus 10,178 ft. of oil. This well also recovered oil from the Devonian at 11,602-11,808 ft. Location is in Section 28, Block 41, Township 2 South, T&P Survey.

Jeff Davis wildcat . . . Gulf Oil Corp. 1-A Kingston, 23 miles north of Fort Davis in Jeff Davis County, reported slight shows of oil on a drill-stem test between 4,500-30 ft. Recovery on a 1-hour test was 450 ft. of mud cut with fresh water and slight shows of heavy oil. Flowing pressure was 200 psi., and 15-minute shut-in pressure was 1,650 psi. Operators drilled ahead in dolomite and sand.

Reeves County . . . Ken Regan 1 Prewitt, Delaware sand wildcat 12 miles south of Pecos, was installing pump for production tests. The well developed some free oil and water on swabbing tests from open hole at 4,935-55 ft.

Tom Green County . . . L. L. Lookabaugh 1 Rust, Ellenburger discovery 9 miles northwest of San Angelo, has been completed for a flowing potential of 161 bbl. of 48° oil a day. Choke size was 10/64-in. and pay section was open hole at 6,603-17 ft., total depth. Top of the Ellenburger was 6,599 ft. on elevation of 2,133 ft. This is the county's only Ellenburger production.

SOUTHEAST NEW MEXICO

Twin to First Bell Lake Test Reaches Devonian

Continental Oil Co. 1-A Bell Lake Unit, twin to the operator's first operation in the new Bell Lake field, has placed a tentative top on the Devonian.

This field, which has production from the Pennsylvanian, or Permo-Pennsylvanian, is important in that it lies on

Continental 1-A Bell Lake was in the Devonian, but was having trouble with lost circulation at 15,026 ft. on latest report.

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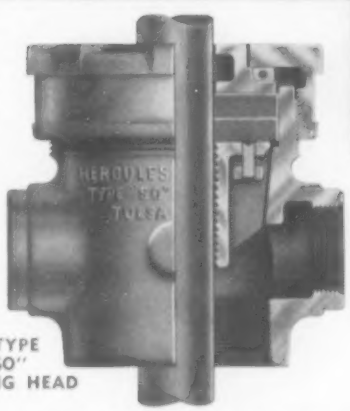

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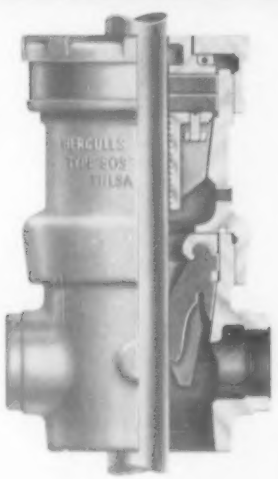

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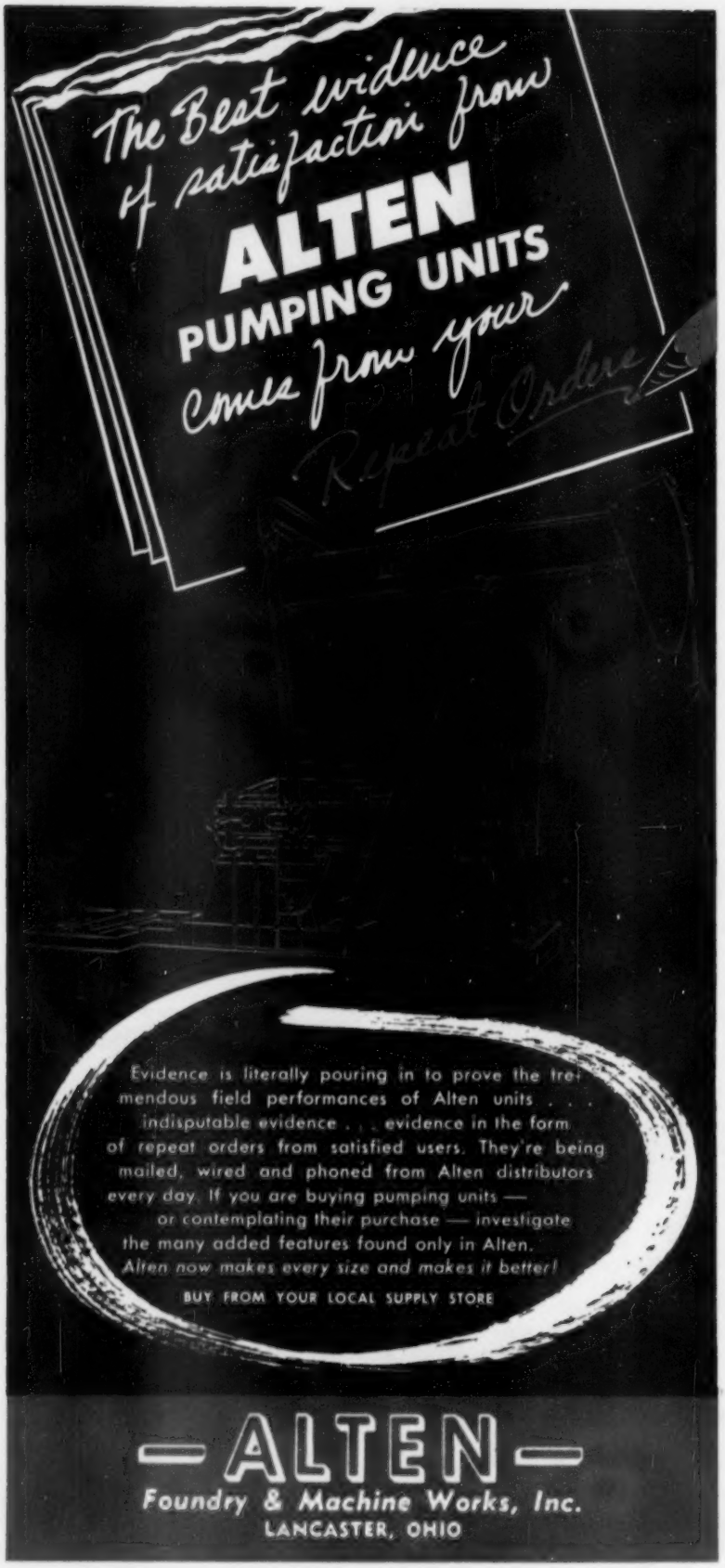
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the northeastern rim of the Delaware basin. Few tests within the basin have penetrated the thick Permian beds.

Continental 1-A Bell Lake had the Devonian at 14,930 ft., minus 11,297 ft., by samples. It had not been tested at this report, and was drilling ahead at 15,005 ft. in limestone. Drill-stem tests are scheduled at the first show of porosity.

At its present depth, 1-A Bell Lake is the deepest test in the immediate area. Richardson & Bass 1 Legg, 22 miles to the northwest, drilled to 15,854 ft., then plugged back to 6,122 ft. Lowest formation marker in 1 Legg was the Mississippian at 14,870 ft., minus 11,561 ft.

ARK-LA-TEX

EAST TEXAS

Limestone County Wildcat Flows Gas From Travis Peak

Lawton Oil Corp. 1-A Tucker, wildcat 4½ southeast of Fallon, flowed an estimated 3,000,000 cu. ft. of gas a day from intervals in the Travis Peak between 7,631-74 ft. Operators planned to run several tests of the formation, then shoot in the Pettit limestone. Tops were the Pettit at 7,405 ft. and Travis Peak at 7,604 ft. on elevation of 464 ft.

Smackover test dry . . . Stanolind Oil & Gas Co. 1 Peveto, 2 miles southwest of Yantis in Wood County, has been plugged at new total depth of 11,104 ft. Tentative top on the Cotton Valley was 9,480-90 ft. Stanolind originally drilled the well to 8,405 ft.

GULF COAST

TEXAS GULF COAST

Bee County Discovery Yields Gas-Condensate

Holmes Drilling Co. and Robert Mosbacher have a new gas-condensate discovery 7 miles northwest of Beeville, in Bee County.

The discovery, at their 2 Collier, in the Patrick Carroll Survey, is in Wilcox sand at 9,233½-37½ ft.

Production tests have not been completed, but a preliminary drill-stem test, open 3½ hours, had 1,990-psi. working pressure with bottom-hole flowing pressure of 2,990 to 4,080 psi. Shut-in pressure gaged 5,910 ft. Fluid recovery was 11 joints of condensate with 2 joints of mud, foam, cement, and acid water.

Indications of production were given

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in the operators' first test, 1 Collier, 330 ft. southwest, which encountered strong gas pressure in the top of the Wilcox. The first hole was junked with stuck drill-pipe.

Second Pay Zone Opened In East Ganado Field

The Texas Co. has opened another pay zone in its 1 Hlavinka, in East Ganado field, 2 miles east of Ganado, in eastern Jackson County.

The new pay, in upper Frio sand, is perforated at 6,324-28 ft. Flow through 7/32-in. choke was at the rate of 55 bbl. of net oil per day with 30 per cent basic sediment and water. Flowing pressure was 450 psi., and gas-oil ratio 5,791 cu. ft. per barrel.

The well also is productive from a deeper Frio sand, perforated at 6,490-92 ft., in which it was completed last June.

Production from the 6,300-ft. sand is the first in the field from that pay. It has been indicated in other wells.

Yegua Oil Discovered on Humble Northwest Side

Yegua oil production at Humble, in northern Harris County, is being extended to the northwest flank of the dome by a discovery by Starr Oil & Gas Co. and Edwin L. Cox.

The new discovery well, 4 Bender, completed with pay at 5,330-35 ft., is northwest of the operators' 1 Bender, a gas-discovery well in basal Frio sand at 2,741-44 ft.

Production of the Yegua discovery well was gaged at 238 bbl. of 34.2°-gravity oil per day, flowing through ¾-in. choke. Flowing pressure was 630 psi. and gas-oil ratio 424 cu. ft. per barrel.

FLORIDA

Continental Will Drill Deep Test in Florida

Continental Oil Co. is getting ready to drill a deep test in the South Florida basin. It will be the company's debut to wildcatting in this state.

Location of the test, 1 Carleton, is in Highlands County, 30 to 35 miles west of Lake Okeechobee. It is about 65 miles north of Humble Oil & Refining Co.'s Sunniland field, the nearer of the state's two productive areas. It is 165 miles northwest of Miami. Spot is in the C NW NE 20-38s-28e.

The test will be carried at least to the Glen Rose-Sunniland (Lower Cretaceous) formation, productive horizon both of the state's two fields (Sunniland, in Collier County, and Forty Mile Bend, in Dade County). Projected depth is 11,000 ft.

Portion of South Florida showing location (arrow) of Continental Oil Co.'s projected deep test, 1 Curry, in Highlands County.

Drilling follows extensive geophysical work in the general area where Continental has extensive lease holdings.

Only one other test is drilling in the South Florida basin, this being by Humble Oil & Refining Co. at 1 Curry, in 8-47s-29e, about 10 miles northwest of Sunniland field, in Collier County. Commonwealth Oil Co. has had location for a deep test at the south tip of the state in Monroe County.

SOUTH LOUISIANA

Little Bayou Pigeon Area Waits Confirmation Test

Continental Oil Co. as yet has not started any additional development to confirm its new oil discovery in the Little Bayou Pigeon area, in the northeastern arm of Iberia Parish, 25 miles east of New Iberia.

Its discovery well, 1-C Jeanerette, is shut in temporarily for outlet following completion of Miocene sand with perforations at 7,447-53 ft. Completion gage was 159 bbl. of oil per day, flowing through ⅛-in. choke. Flowing pressure was 750 psi., and gas-oil ratio only 173 cu. ft. per barrel. Gravity of the oil was 35.9°.

Continental Oil Co.'s new oil-discovery well (shown by arrow) in northeastern arm of Iberia Parish.

The well also is a potential gas-condensate producer in a deeper horizon, where, in previous tests with perforations at 12,207-32 ft. it flowed at the rate of 3,876,000 cu. ft. of gas and 16 bbl. of condensate per day through 15/64-in. choke.

Little Bayou Pigeon area is about 1½ miles northwest of the original Bayou Pigeon field, where production was discovered in 1940.

West Delta Area Yields New Oil-Field Discovery

Continental Oil Co. is opening another field in the Gulf of Mexico off the Mississippi River delta of Plaquemines Parish.

Discovery well, productive of gas and condensate, is in Block 58, West Delta Area, on the west side of the delta. It is 10 miles from nearest shore point.

Testing a Miocene sand interval at 11,668-78 ft., the well (1-A State Lease 983) flowed at the rate of 244 bbl. of 53°-gravity condensate per day with 1,863,000 cu. ft. of gas. Flow was through 11/16-in. choke with pressure of 4,200 psi.

Continental Oil Co.'s new offshore discovery well (arrow) in Block 58, West Delta Area, on the west side of Plaquemines Parish's Mississippi River delta.

A prior test of a deeper zone, perforated at 13,060-63 ft., got dry gas. Hole had been drilled to 14,580 ft., and pipe run to 13,120 ft.

Location is 7½ miles west of an oil-discovery well Continental tested last October in Block 54. That well, which flowed a the rate of 182 bbl. of 42.7°-gravity oil per day through ⅛-in. choke, has pay interval at 12,134-62 ft. No additional wells have been drilled.

The latter discovery, in turn, is about 2 miles west of Continental's prolific multipay West Delta Block 53 field, opened in June 1953.

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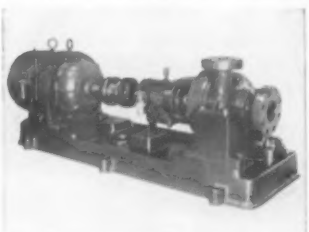

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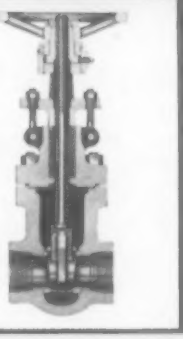

fig. no. 3651
o. s. & y., bolted bonnet gate valve. a premium valve available in a wide choice of trim materials and recommended where a full port opening is required.

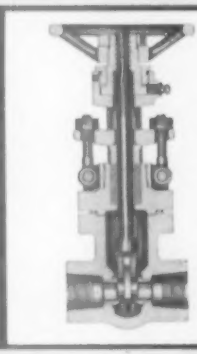

fig. no. 595
o. s. & y., bolted bonnet gate valve. comparable to fig. no. 3651 but somewhat more economical and its use is suggested where a full port opening is not essential.

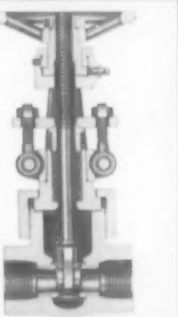

fig. no. 55
o. s. & y., union bonnet gate valve. an economical valve for those that prefer the compactness and dismantling features of the union bonnet construction.

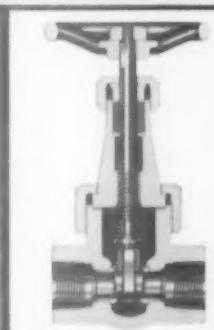

fig. no. 65
inside screw, union bonnet gate. a low cost compact valve for use where space and weight are important and where a full port opening is not required.

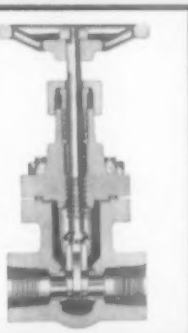

fig. no. 695
inside screw, bolted bonnet gate. the "competitor" to meet the tightest cost budget, yet offering the bolted-on bonnet feature. comparable to fig. no. 65.

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GREAT LAKES

MICHIGAN

Dundee Oil Discovery Seen for Isabella County

A new Dundee oil discovery appeared likely for Gilmore Township, Isabella County, at the John Neyer et al 3 Powell, SE SE NE 30-16n-5w.

This is the fifth wildcat drilled in the general area by the operators. Three

Here is western Michigan's new Ensley-Traverse oil pool. The field has two producers. The well to watch in the area is Ace Oil Co. 1 Cushman, SW NW SW 8-11n-11w.

of the previous four were taken to the Dundee, while one was quit at the base of the Marshall after upper makers were checked in structurally low. The first of these wildcats carried a near-commercial pay in the Dundee. This was the 1 Powell, N¼ NE NE 30-16n-5w. The operators plan acid treatment for the 3 Powell prospect.

The 3 Powell, if it is a new field opener in the Dundee, will lead to development to the south and southeast. All of the wildcatting done by the group has been to the north, northwest and northeast of the 3 Powell. The operators are Neyer, Ray Miller, and Byron Gallagher.

EASTERN INTERIOR

WESTERN KENTUCKY

In Christian County Walter Sargent has a new pool discovery at 1 Grace, 22-H-26. The well is swabbing 245 bbl. of oil per day from the Jackson sand at 553-578 ft. It is located 2 miles southwest of Apex and 1 mile west of Apex pool production.

ILLINOIS

In Edwards County, 2 miles west of Albion, John Oslager has begun completion work at 1 Phillip Potter, SW SW NW 4-2s-10e. He has set casing to test the O'Hara (Mississippian). This lime flowed oil in 2 hours on a drill-stem test at 3,308-22 ft. Recovery was 2,220 ft. of oil, 180 ft. of oil-cut mud with formation pressure showing 1,450 psi.

Three areas in the state made news for the number and size of the wells completed. In Eldorado and Eldorado North in Saline County, 10 producing wells and 3 dry holes were completed in January. The best wells produce from the Waltersburg sandstone, with four wells having initial productions of 714, 960, 1,100, and 1,300 bbl. of oil per day. There were also good, though smaller, wells completed in the Aux Vases and Tar Springs sandstones. Eighteen wells were drilling at the end of the month.

In the Rural Hill West-Cantrell Consolidated area in Hamilton County, 15 producing wells and 5 dry holes were reported as completions. Most of the production in this area is from the Aux Vases sandstone, with the two best wells flowing 1,198 and 1,368 bbl. per day initially. Eight wells were drilling at the end of January.

The third area is between Maunie North and New Harmony Consolidated

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pools in White County. Eight producing wells were completed. The best well flowed 624 bbl. from the Aux Vases sandstone, and several others made around 200 bbl. a day initially. Half a dozen sands are producing in this area. Twelve wells were drilling at the end of the month.

WESTERN CANADA

Geophysical Exploration Picks Up Speed on Prairies

Geophysical exploration in the Prairies Provinces of Western Canada has jumped 16 per cent in the past 2 months. The Daily Oil Bulletin reports 162 crews in the field . . . 150 seismic and 12 gravitymeter. This figure is lower than 1 year ago when 180 crews were active.

This boost in seismic work is accompanied by a sharp increase in drilling and completion work in the area. Between 240 and 250 rigs are operating on the prairies this winter.

SASKATCHEWAN

Second Follow-Up Well Completed at Rosebank

The second follow-up well in the Rosebank area has been completed by Imperial at 3-36M-4-32 Rosebank with production from the Mission Canyon.

The well is ¾ mile northeast of the discovery well, 9-26 Rosebank. It is 4 miles southeast of Nottingham, 13 miles west of the Manitoba border in the Williston basin. It is also 34 miles northeast of Frobisher field.

Weyburn . . . Central Leduc-Del Rio 14-6 Ralph, LSD 14, 6-7-13w2, Weyburn area discovery in the southeast part of the province, is a Mission Canyon oil discovery. The well is 10 miles southeast of Weyburn town, 18 miles west of nearest production at Hunton-Mississippian field.

ALBERTA

Rank Wildcat in Far Northwest Shows Cardium

Stanolind Oil & Gas Co. has interesting showings in the Cardium sand at a remote wildcat in the far northwest reaches of the province, 55 miles southwest of Grande Prairie.

Oil stained cores were found in an upper Cardium sand but no tests have been made. The wildcat is A-1 Chinook Ridge, LSD 3, 12-65-13w6, in virgin exploratory area.

Pembina report . . . Stanolind Oil & Gas Co.-Hudson's Bay 69 Pembina Crown "A," flowed 370 bbl. of 39°-gravity oil in 24 hours through 16/64-in. choke. The Cardium sand was topped at 5,204 ft., and the well's total depth is 5,281 ft. Location is on LSD 2, 23-48-9w5.

Consolidated MIC MAC Oils, Ltd., and Yankee Princess Oils, Ltd., completed their fourth oil well on a half section tract in Pembina field, about 65 miles southwest of Edmonton.

The Cardium sand was perforated and given fracturing treatment. The well established an initial potential of 900 bbl. of oil per day during a 5-hour test through 15/64-in. choke. This well, like the former three on the 320-

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General	Central band wheel, all-silent V-belt drive, all dbl. brakes, 3 full width drums with individual drives.		Band wheel, V-belt drives. 3rd leg optional on S-33 for 250,000# capacity. 3 drums with double brakes.			Well completion and servicing machines equipped for spudder jobs. All drums full width. Chain spudding drive.					WS-31 has 3 drums, WS-20 has 2 drums. Big performance at low cost.	
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Workover to:	14,000'	4,000'	6,000'	4,000'	3,000'	8,000'	6,000'	4,000'	3,000'	2,000'	1,500'	750'
Weight (#)	70,000	32,000	42,000	26,000	22,000	50,000	38,000	28,000	15,000	10,000	9,600	7,000
Mast Height (Adj.)	65'	60'	60'	55'	55'	60'	60'	60'	55'	45'	45'	32½'
Working Capacity (#)	170,000	100,000	100,000	100,000	60,000	170,000	100,000	60,000	60,000	60,000	60,000	25,000

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acre area, is owned 50-50 by the two companies. The well, 12-35 Pembina, is ⅜ mile southwest of the 14-35 well, another Cardium producer. It is on LSD 12, 35-47-8w5.

MANITOBA

Mississippian Oil Found Southwest of Virden-Roselea

Imperial Oil, Ltd., has found a good showing of light oil on test of the Mississippian at a wildcat 2½ miles southwest of the proven limits of Virden-Roselea field in southwestern Manitoba.

The well, 5-9-10-26 Virden, recovered 100 ft. of oil with some water.

PACIFIC COAST

CALIFORNIA

Exploratory Drilling Lags Last Year's

Wildcatting was getting off to a slow start in California. At the end of January, 10 fewer tests had been drilled than in the first month of 1954. Work during February was somewhat on the same basis but as the month closed there were indications of a pick up.

Due to the town-lot drilling at Huntington Beach, development drilling was continuing to exceed last year's effort. At mid-February 329 applications for permits had been filed with the Division of Oil and Gas, as compared with 278 at that time a year previous. The most recent report showed 75 notices to drill new wells. Of these 61 were development wells.

Oxnard Given Set-Back

The Texas Co.'s ¾-mile southeast extension attempt to the Oxnard deep pools has been abandoned after lower Sespe sands proved noncommercial. The wildcat, 1 Capital-Silva in NW NW 8-1n-21w, had been drilled to 9,363 ft. and 7-in. casing set at 8,985 ft. after plugging back to that depth.

WASHINGTON

New Washington Wildcat

Continental Oil Co. was under way with a new wildcat in the Oysterville area of Pacific County, Washington. The new test, its seventh of the past year for the state, was 1 Oysterville State in 33-13n-11w. The operator abandoned its Grays Harbor County test, 1 Griffin & Wagoner in 33-19n-7w, after drilling to 3,950 ft.

APPALACHIAN

WEST VIRGINIA

Huntersville district, Pocahontas County, West Virginia, United Fuel Gas Co. 8176 S. M. Chapman, wildcat, elevation 2,429 ft., recorded the Oriskany sand 3,445-85 ft., water at 3,507-15 ft., and drilling at 3,529 ft.

- In Circleville district, Pendleton County, Columbian Carbon Co. 2-1203 U.S.A., after a fishing job has again resumed drilling and is at 6,059 ft.
- Licking district, Tucker County, Hope Natural Gas Co. 9924 Alex Neston heirs, is at 1,670 ft.
- Union district, Preston County, Columbian Carbon Co. 1207 L. D. Berger is drilling at 4,423 ft.
- Walker district, Wood County, Hope Natural Gas Co. 9634 Power Oil Co., deep test, after coring, is drilling at 13,273 ft.

OHIO

Beldon Oil & Gas Co. 1 Rohr Vaughn, Section 20, Marlboro Township, Stark County, the second producer is a new pool and ⅓ mile southeast of the discovery well, logged the Clinton at 4,659-93 ft. with a production of 75 bbl. after fracturing.

- In the south part of Flint Ridge

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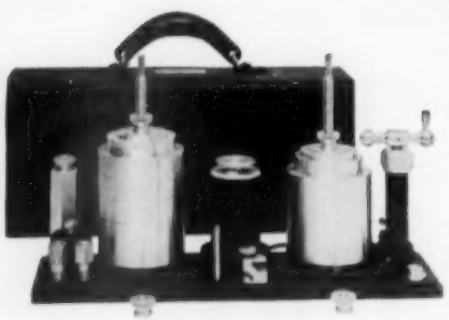

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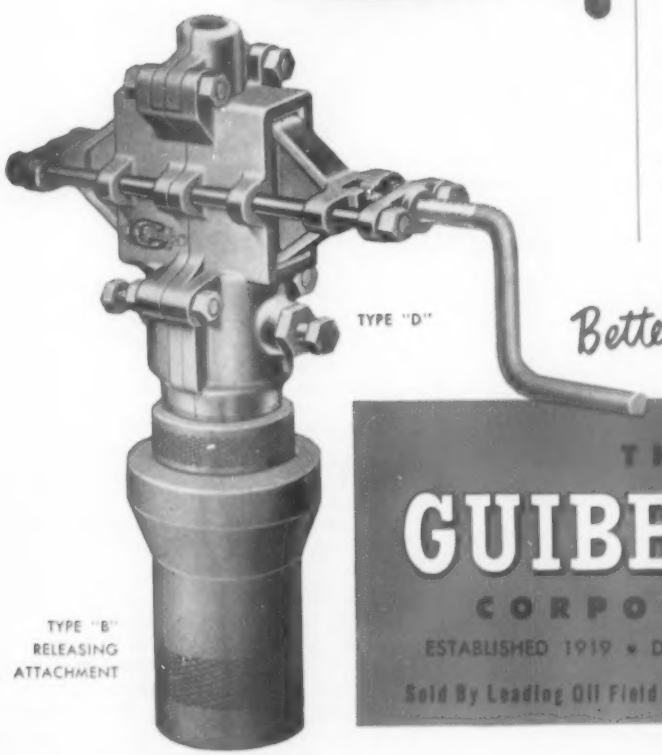

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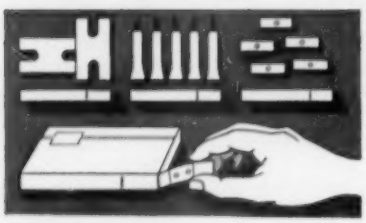

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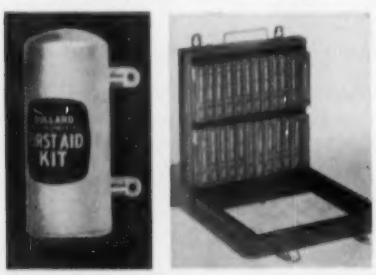

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pool, Oxford Oil Co. 4 Claggett, Section 19, Hopewell Township, Licking County, made 60 bbl. after treating Clinton found at 3,022-73 ft.

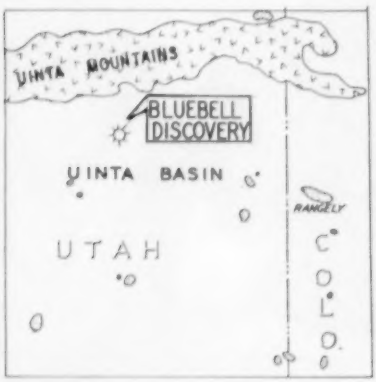
● Oxford Oil Co. also extended the pool in southwest Licking Township, Muskingum County, a location to the east. The 1 J. Frizzell, 3rd Qr. made 500,000 cu. ft. gas and 80 bbl. oil in a 24-hour test after fracturing the Clinton, found at 3,070-3,122 ft.

ROCKY MOUNTAIN

UTAH

Grand County Discovery Finaled in Morrison

Carter Oil Co. has Sandfraced its 1 Larsen-State, C NE NW 2-20s-24e, in the Seiber Nose area of Grand County.



Carter Oil Co. completed 2 Bluebell Unit in Duchesne County for 5,370 M.c.f. of gas per day from the Green River (Tertiary.)

The company reported a flow of 126 bbl. of oil per day after topping the Morrison sand at 1,429 ft.

The well swabbed 40 bbl. of oil per day, natural. The well is located 16 miles southwest of B-X and 9 miles north of Cisco. Shallow production is also found at these two fields. Carter expects to engage in more development work in the immediate area soon.

WYOMING

Oil Recovered on Test At Campbell County Well

Newcastle sand production is indicated at a wildcat in Campbell County. Black Hills Drilling Co. 1-A Government-Crawford, C SE SE 27-54n-69w, recovered 90 ft. of oil at 5,441-49 ft.

Nearest production to this test is 8 miles southwest in Mitchell Creek field. That area has Minnelusa production.

South Riverton Dome . . . Atlantic Refining Co. has set casing at 9,896 ft. at the 1 O'Connor, C NE SE 1-2s-4e(WRM), Fremont County.

The discovery recovered gas from the Frontier sand at the rate of 2,787 M.c.f. per day on test at 8,555-8,601 ft. The discovery is 1½ miles south of Riverton Dome field which produces from the Tensleep at 11,660 ft.

Unit approved . . . Mobil Producing Corp. has gotten USGS approval for the Ainsworth Unit in Big Horn County.

This block has about 2,200 acres. The unit boundary encloses a Phosphoria discovery drilled by Gulf-Mobil 2 years ago at 1 Thomas, C S½ NE SE 33-50n-92w. The discovery well finaled for 807 bbl. of oil and 976 M.c.f. of gas per day from 7,089-7,160 ft. in the Phosphoria. The unit now has four Phosphoria wells.

Goshen County . . . F. R. Anderson and Great Basins Petroleum Co. continued tests at their discovery in 33-24n-61w, Denver - Julesburg basin's northernmost oil producer. The last reported gage was 67.93 bbl. of oil per day on the pump.

Third Well at Big Grieve Unit in Natrona Completed

Forest Oil Co. has completed 4-22-3 Government, NW NW SE 22-32n-85w, in the Grieve Unit, for a flow of 700 bbl. of oil per day on ¼-in. choke.

The Grieve Unit was opened last year as one of the big discoveries of the year for Wyoming. It is located about 35 miles southwest of Casper. Production is from the Muddy zone of Thermopolis shale at the interval 6,870-6,999 ft. All wells were completed with high potentials. The discovery well was finaled for over 1,000 bbl. per day.

COLORADO

New "J" Sand Discovery Reported in Logan County

Logan County has a new "J" sand discovery at Great Basins Petroleum Co. 41-19 McEndaffer, C NE NE 19-10n-54w.

Early tests at the wildcat made 94 bbl. of oil per day. Latest test reported got 135 bbl. of oil per day cut with sediment and water. The well is 2 miles north of West Plains.

Washington County . . . Argo Oil Co. got 30 ft. of good sand saturation at 1 Petrie in SE SE NE 10-2n-49w.

This recovery is reported to be below the zone that recovered 1,906 ft. of oil on a drill-stem test earlier. The discovery is a confirmation to Thomson-Oliver 1 Warren in SW SW NW 11-

A commercial gas discovery is reported at a western Idaho wildcat, Oroco Oil & Gas Co. 1 Carpenter in Payette County.

2n-49w. This section of eastern Washington County is one of the most active areas in the entire Rocky Mountain region, and certainly the busiest in the Denver-Julesburg basin.

NEVADA

Shell Coring Ahead at Nye County Confirmation

Shell Oil Co. is coring below 6,800 ft. at 35-35 Eagle Springs Unit, NW NE SW 35-9n-57e, Nye County.

This confirmation well is 1,700 ft. south of the discovery well of the state's first oil production. A drill-stem test at 6,606-78 ft. got 6,020 ft. of oil in 2 hours 38 minutes. Another test at 6,687-6,758 ft. recovered 660 ft. of gassy, oily mud.

The biggest point of interest in this well is its pay zone. The discovery well at Eagle Springs had production from vugs in volcanics, while the confirmation well is producing from sand and lime with small vugs and oil stain in the vugs.

NORTH TEXAS

Fisher Wildcat Is Canyon Sand Prospect

Sinclair Oil & Gas Co. 1 McIntyre, 4 miles north of Sweetwater, in Fisher County, made a good flow of oil after fracturing, then prepared to run completion tests.

A drill-stem test in sand from 5,241-61 ft. recovered 150 ft. of oil and 300 ft. of heavily oil-cut mud. Operators treated the section with 6,000 gal. of oil and 6,000 lb. of sand, then opened it through ½-in. choke. It flowed 404 bbl. of load oil in 10 hours, then 192 bbl. of 41.4° new oil in 3 hours on the same size choke. Flowing tubing pressure was 360 psi. and gas-oil ratio was 926:1. Total depth was 6,660 ft.,

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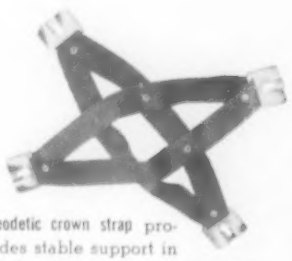

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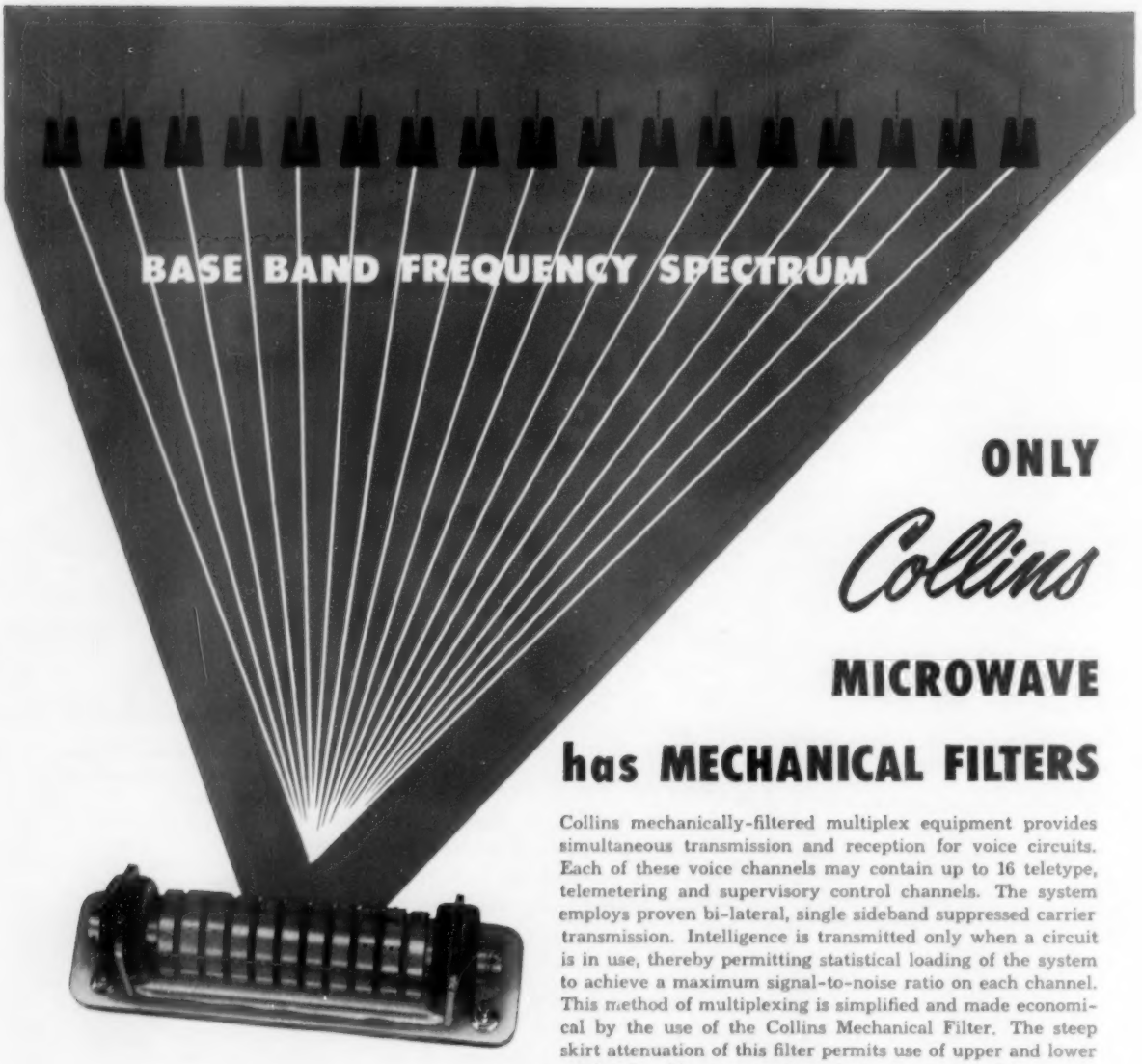

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COLLINS

plugged back to 5,285 ft. Nearest production is 6 miles to the southeast in the North Favor field.

Stephens test running pipe . . . Warren Petroleum Corp. was setting 5½-in. pipe for completion tests at 1 Boyd, Mississippian strike 6 miles southeast of Woodson. The well indicated commercial production on a drill-stem test at 4,290-96 ft. In 2 hours the recovery was 25 ft. of oil and 70 ft. of oil-cut mud.

Taylor County . . . West Central Drilling Co., Abilene, 1 Edgar Brown, wildcat 1 mile west of Tuscola, had prospects of production from the Goen limestone. Drill-stem test from 4,240-55 ft. had gas in 7 minutes and recovered 250 ft. of free oil, 265 ft. of heavily oil-cut mud and 125 ft. of salt water. Flowing pressure was around 30 psi., and 30-minute shut-in pressure 1,455 psi. Operators drilled ahead after the test.

MISSISSIPPI

Warren County Wildcat Uncovers New Salt Dome

California Co. has discovered another salt dome in Warren County, in western Mississippi. It becomes the seventh known dome in the county.

Discovery was made in the company's 1 Board of Supervisors, in 24-9n-19w, 2½ miles southwest of Oak Ridge, in the central part of the county.

The well topped salt just above 5,078 ft. Hole was still in salt at 5,700 ft. with drilling continuing to check on a possible overhang.

There are approximately 50 known salt domes in Mississippi, of which only 3 have proved productive, this being small.

Successful Wildcats

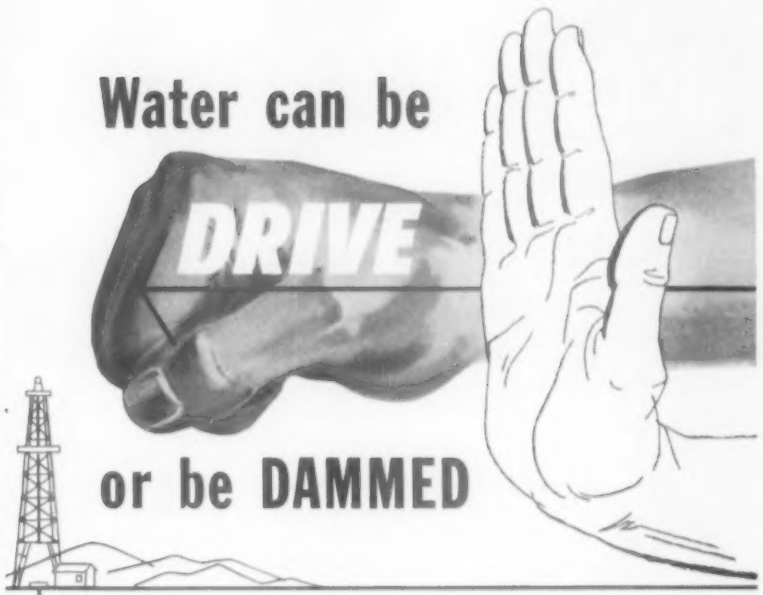
SOUTHWEST TEXAS

Atascosa County: C. C. Winn and Eastern States Petroleum Co. 1 Downey, Noah Scott Sur. IP 86 BOPD, 3/16-in., 28.° Navarro 5,224-38 ft. (perforations). TD 5,297 ft. (New pay in South Pleasanton field.)

Hidalgo County: Chicago Corp. 1 Villarreal Unit, Tract 10, Share 9-A, San Ramon Grant. IP 11,100 M.c.f. daily, open-flow potential, gas-condensate ratio 93,400 cu. ft. per barrel, 54°, perforations 8,214-24 ft. TD 8,412 ft. (New pay in San Ramon field.)

Starr County: Lockhart Oil Co. 2 Brock, Porcion 86. IP 4,600 M.c.f. daily, open-flow potential, gas-condensate ratio 115,000 cu. ft. per barrel, 59.6°, perforations 2,792-2,810 ft. TD 3,027 ft. (New pay in North Ross field.)

Selby Walker Corp. 1 Rowe, Share 5, San



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Other advantages of Dicalite filtration are the smaller space requirements (about 1/5 that of sand filter systems), lower installation costs and mobility if desired. Several newer diatomite systems, lately put in operation, are completely unitized for easy moving.

The vital question of filtration in water-flood operations is covered in detail in a new bulletin now in preparation. If you would like a copy, write us at the address below . . . you will receive your copy as soon as it is off the press.

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Jose Grant. IP 800 M.c.f. daily, open-flow potential, gas-condensate ratio 148,000 cu. ft. per barrel, 68°, perforations 7,454-60 ft. TD 7,656 ft. (New field—Jay Simmons Segment B field.)

TEXAS GULF COAST

Bee County: Hillsman-Greenburg 1 Roberts est., Oscar Farris Sur., A-161. IPP 18.56 BOPD, 41°, perforations 3,161-69 ft. TD 3,176 ft. (New field.)

Galveston County: John W. Mecom 4 Ervine & Bishop, Alex Farmer Sur., A-11. IP 10,500 M.c.f. daily, open-flow potential (flowed 1,760 M.c.f. daily and 362 BCPD through 5/32-in. choke on 5-hour test), 53.6°, perforations 13,434-50 ft. TD 15,028 ft. (New field—1½ miles west of Gillock field.)

Harris County: Sinclair Oil & Gas Co. 1 Frazer, Charles Clarkson Sur., A-190 (1 mile north of Satsuma). IPP 86.68 BOPD, 41.8°, perforations 6,560-64 ft. and 6,571-73 ft. TD 7,945 ft. (New field.)

Jefferson County: Adams & Haggarty 7 Marrs McLean. EL&RR Sur. 373, A-551. IP 131.09 BOPD, 3/16-in., 20.4, perforations 5,436-46 ft. TD 6,201 ft. (New pay in Big Hill field.)

Lavaca County: Sun Oil Co. 1 Borchers, Laura E. Swingle Sur., A-564. IP 3,400 M.c.f. daily, open-flow potential, gas-condensate ratio 45,300 cu. ft. per barrel, 52.2°, perforations 8,818-41 ft. (Wilcox). TD 9,325 ft. (New pay in Chicolette Creek field.)

WEST CENTRAL TEXAS

Callahan County: Callihan Rotary Co. 1 Baum, Victoria CSL Sur. 202, 8½ mi. W Cross Plains. IPP 48 BOPD, 42°, GOR 150, Cross Plains sand 1,881-84 ft. TD 1,858 ft.

Shackelford County: A. J. Frazier 1 Davis, Sec. 8, GH&H Sur., A-943, 9 mi. SE Lueders. IPP 153.7 BOPD, 39°, GOR zero, Bluff Creek sand 1,637 ft. TD 1,646 ft.

NORTH TEXAS

Cooke County: Sinclair Oil & Gas Co. 1 Brannon, Alex Horton Sur., A-443, 12 mi. NE Gainesville. IP 266 BOPD, 16/64-in., 45°, GOR 425, TP 300 psi., Strawn sand 4,496-4,506, 4,749-53 ft. TD 5,798 ft.

Jack County: Russell Maguire 1 Graham, TE&L Sur. 2745, 2½ mi. S Jermyn. IPP 8½ BOPD, 40°, GOR zero, Strawn 3,212-22 ft. TD 3,450 ft.

Wilbarger County: Cullum Brothers 1-A Cullum Brothers-Waggoner, 16-13-H&TC, 2½ mi. SW Electra. IPP 65.7 BOPD, 40°, Gunsite lime 1,922 ft. TD 1,930 ft.

WEST TEXAS

Crane County: Bankline Oil Co. et al 1 Beakley, 24-2-H&TC Sur., 7 mi. E Imperial, 2 mi. NE Abell-Simpson field. IPP 61 BOPD, 37°, GOR zero, Tubb pay 3,941-4,015 ft. TD 6,665 ft., elev. 2,384 ft., top Simpson 5,140 ft.

Pecos County: Brown & Thorp Drilling Co. 2 Clark, 50-11-H&GN, 3 mi. S Girvin. IPP 30 BOPD, 36°, GOR 250, pay 2,995 ft. TD 4,743 ft.

Runnels County: Thos. D. Humphrey & Sons 1 Cooper, Norvelle Travis Sur. 537, 7 mi. SE Winters. IP 86 BOPD, 20/64-in., 40°, GOR 220, TP 240 psi., Mossis sand 3,570 ft. TD 4,309 ft.

SOUTHEAST NEW MEXICO

Lea County: Superior Oil Co. 1-335 State, 19-13s-32e, on S end of Drickey field. IP 158 BOPD, 25/64-in., 41.5°, GOR

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1709, TP 220 psi., pay 11,097 ft. TD 12,519 ft., elev. 4,387 ft.

SOUTH LOUISIANA

Acadia Parish: Pan American Production Co. 1 Beaugh Unit, 79-8s-2e. IP 160 BCPD and 2,000 M.c.f. daily, 10/64-in., 43.3°, perforations 11,368-76 ft. (LS-1 sand). TD 12,424 ft. (New pay in Church Point field.)

Assumption Parish: Texas Gulf Producing Co. and Pan American Production Co. 3-A Dugas LeBlanc, 28-12s-14e. IP 192 BOPD. 13/64-in., 33.2°, perforations 9,436-40 ft. TD 9,694 ft. (New pay in, and extends Napoleonville field.)

Iberia Parish: Continental Oil Co. 1-C Jeanerette, 11-12s-10e. IP 159 BOPD, ⅛-in., 35.9°, perforations 7,447-53 ft. TD 13,001 ft. (New field—Little Bayou Pigeon.) Pigeon.)

Iberville Parish: Shell Oil Co. 1-A Schwing et al, 99-10s-10e. IP 227 BOPD, ⅛-in., 41.8°, perforations 9,286-92 ft. TD 12,601 ft. (New pay, and first oil production in Bayou Sorrell field).

Shell Oil Co. 1-B Schwing et al, 6-10s-11e. IP 162 BOPD, 8/8-in., 40.8°, perforations 0,290-96 ft. TD 11,155 ft. (Confirms oil discovery and extends Bayou Sorrell field.)

Lafourche Parish: Stanolind Oil & Gas Co. 1-A Godchaux, 39-15s-19e. IP 110 BCPD and 2,600 M.c.f., 5/32-in., perforations 12,850-60 ft. TD 14,750 ft. (New pay in Raceland field.)

St. Mary Parish: Shell Oil Co. 1 State Lease 166, Block 14, Eugene Island area, Gulf of Mexico. IP 324 BOPD, ⅛-in., 38°, perforations 10,016-20 ft. TD 11,020 ft. (New oil pay in Eugene Island Block 18 field.)

ARKANSAS

Union County: Olin Oil & Gas Corp. 1 Hankton, C NW NE SW 19-19s-12w. IPP 9 BOPD, Nacatoch sand 2,317-39 ft., and from open hole at 2,339-50 ft. TD 2,350 ft. (Discovery of East Aurelle field.)

Olin Nunnally, C SW SE NE 19-19s-12w. IPP 15 BOPD, Nacatoch open hole 2,324-41 ft. TD 2,341 ft. (Extension to East Aurelle field.)

OKLAHOMA

Oklahoma County: C. N. Valerius et al 1 State, 1 mile south of East Prairie Bell, NE NW NW 16-14n-3w. IPP 30 BOPD, Simpson 6,522-38 ft. TD 6,538 ft. (Oil discovery.)

Pawnee County: Lee Oil Co. 1 Troth, 3¼ mi. northeast of Northeast Buena Vista pool, NE NW NW 5-22n-6e. IP 3,500 M.c.f. of gas per day, Lower Skinner sand 2,706-12 ft., 24/64-in. choke. TD 3,157 ft. (Gas discovery.)

KANSAS

Ellis County: Lebon Oil Co. 1 Dinkle, SE SE NW 16-14s-17w. IPP 25 BOPD, Arbuckle 3,502-14 ft. TD 3,514 ft. (Opens Southwest Toulon field).

Kiowa County: Gulf Oil Corp. et al 1 Pyle, NE NE NE 16-29s-16w. IPP 304 BOPD, Mississippian 4,666-80 ft. TD 4,728 ft. (Opens Pyle pool.)

Pawnee County: Hilton 1 Lanterman, NW NW NW 1-23s-17w. IPF 30 BOPD, Sooy 4,150-56 ft. TD 4,258 ft. (Opens East Jab pool.)

J. J. Lynn-Sterling Drilling Co. 1 Strobel, NE NE NE 3-23s-18w. IPP 39 BOPD, Sooy 4,310-23 ft. TD 4,743 ft. (Opens West Garfield pool.)

CALIFORNIA

Kern County: Superior Co. 1 Forbes, NW NE 21-30s-21e, IPF 57 BOPD, 15/64-in. choke, 29° gravity, perfs. 4,118-26 in Point of Rocks sand (Eocene), TD 4,761 ft. (Extension to Belgian Anticline field.)

SASKATCHEWAN

Socony-Woodley-Southern 21-14 West Verlo, LSD 14, 21-16-20w3. Shaunavon oil well. TD 3,491 ft.

ALBERTA

Gulf-CPR 4 Congdon, LSD 4, 23-42-16w4. Basal quartz gas well. TD 4,955 ft.

Stanolind-Hudson's Bay H-1 Pembina Crown, LSD 16, 19-49-9w5. Indicated Cardium oil well. TD 5,443 ft.

Southern Production-Atlantic 16-22 Ferrier, LSD 16, 22-39-8w5. Viking oil well. TD 9,665 ft.

OKLAHOMA

Eola Field in Garvin County Extended Southwest

Stanolind Oil & Gas Co. has extended production at Eola field in Garvin County one location southwest at 2 McKey "A."

The extension well was completed in the Bromide sand, topped at 7,480 ft. and in the upper McLish, topped at 7,820 ft. Plugged back total depth is 10,190 ft. From the Bromide sand the well flowed 158 bbl. of 41°-gravity oil in 24 hours through 20/64-in. choke. From the upper McLish it flowed 327 bbl. of 43°-gravity oil in 24 hours through 14/64-in. choke. Location is SE NW 12-1n-3w, Garvin County.

High Flow Indicated at Northwest Lindsay Well

High flow capacity is indicated at a well in the Northwest Lindsay area of McClain County.

Gulf Oil Corp. 1 Weaber, SW SW 17-5n-4w, took a drill-stem test in the Oil Creek sand at 11,987-12,095 ft. Gas hit the surface in 29 minutes at 10,500 M.c.f. per day and the oil flowed in 33 minutes. Recovery on breakdown of the fluid recovered was 360 ft. of clean oil and 30 ft. of water. The operator is coring ahead.

Arbuckle Reservoir Being Established Near Davis

Frankfort Oil Co. has indicated commercial Arbuckle lime oil production at a highly-important wildcat on the north side of the Arbuckle Mountains near Davis, Murray County, southern Oklahoma.

The 1 Hale, situated near the regional zone of faulting that trends northwest-southeast, SW NE 4-1s-1e, failed to find oil in the upper zones and went on into the Arbuckle. At about 2,000 ft. in the lime oil show was reported in cuttings. Top of the zone is at 6,740 ft. The first drill-stem test taken recovered 200 ft. of clean oil with 90 ft. of heavily oil-cut mud. Another test at 6,788-6,812 ft. got 400 ft. of oil with some oil-cut mud. The operator is continuing to penetrate at the wildcat.

The adjacent zone of faulting is the controlling factor in structural development over a wide area in this section of Oklahoma. The zone extends along a trend northwest into the Eola area of Garvin County.

Commercial production from the Arbuckle, particularly 2,000 ft. down into the zone, will bring new interest to the area which has been previously thought little of. Most Arbuckle oil is found in the upper zones. This deeper prospect may hold the key to success in this highly-faulted region.

LEGAL

SEALED BIDS will be received until 2:00 P. M., Mountain Standard Time, March 22, 1955, and opened at that time in the Office of the Superintendent, Blackfeet Indian Agency, Browning, Montana, for the leasing of 4,080.97 acres of Tribal land and 33,475.84 acres of allotted Indian land, located in Pondera and Glacier Counties, Montana, for oil and gas mining purposes. The details of lease offerings and how and where to file bids may be obtained by addressing the inquiry to the Superintendent of the Blackfeet Indian Agency at Browning, or call the Agency Land Office, Phone 2561, Browning. Charles S. Spencer, Superintendent.

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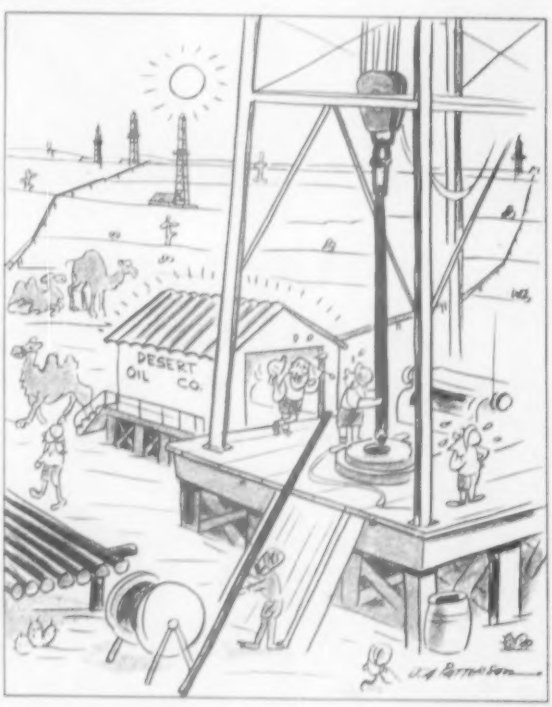

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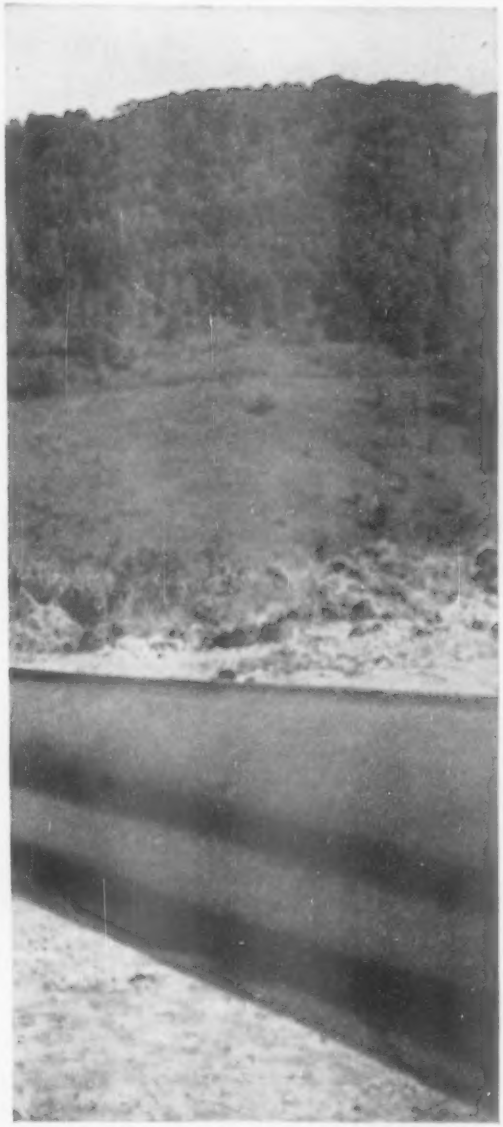
When asked how his crew liked working with NO-OX-ID's, the contractor, Mr. Joyce, stated: "They had never previously applied NO-OX-ID. The ease and convenience of application, plus freedom from personal hazards, caused complete satisfaction all around." As a result, Corning Gas plans to specify NO-OX-ID protection on additional pipeline reconditioning during 1955.

Before you specify on your next job, check with Dearborn...a pipeline engineer is available for consultation.



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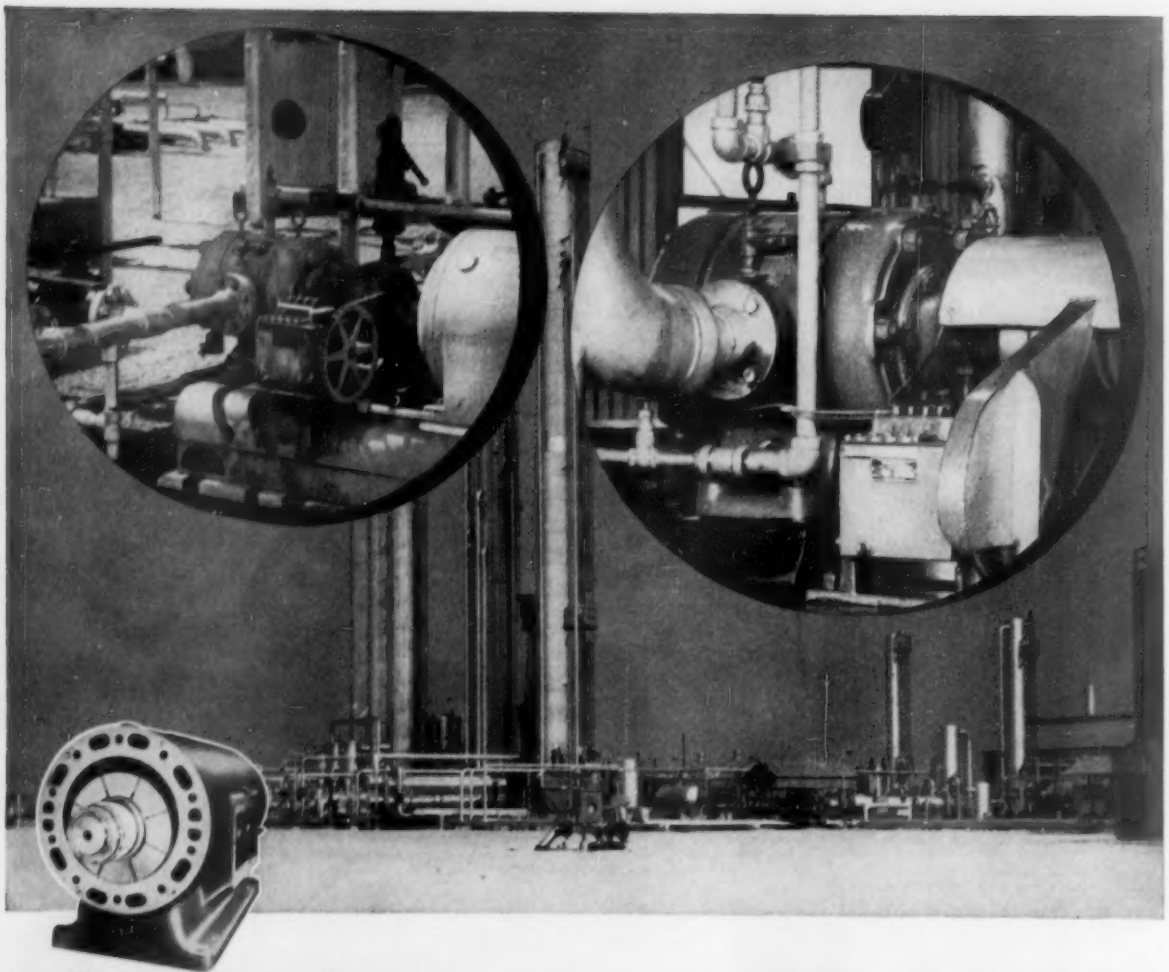

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Fuller Rotary Compressors are used wherever reliability and low maintenance are important.

Illustrated, upper left is a Fuller Rotary Single-stage propane-vapor booster, having a capacity of 55 c.f.m. referred to intake condition of 225-lb. gage (895 free c.f.m.) compressing to 250-lb. gage discharge, operating at 1160 r.p.m. Illustrated on right, Fuller Single-stage gasoline-vapor booster, capacity of 173 c.f.m. referred to intake condition of 75-lb. (1055 free c.f.m.) compressing to 175-lb. gage discharge, operating at 1000 r.p.m.

Fuller Rotary Compressors in the refinery for general plant air, purging gas, recycling, and handling butane-butylene, as well as in the field for pressure boosting and gas gathering, have proved their worth, as is evidenced by the many machines in daily use in practically every oil-producing section of the country.

Simplicity of construction has proved to be one of the important factors . . . the only moving parts being the rotor, bearings, and blades. No valves to leak, no seats to grind, results in maintained capacity for the life of the machine. A simplified direct drive eliminates power transmission losses. For further information, write to

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Scholar-Athlete

He ran through college, has climbed ever since

GORDON H. FISHER was able to make the highest grades of the 1938 petroleum-engineering class at the University of Texas in winning his B.S. degree partly because of his legs.

The recently appointed vice president and general manager of Plymouth Oil Co. didn't use his underpinners as a crib sheet or to balance an open book—he was on a track scholarship.

However, his U. of T. activity didn't end with studies and sports. Fisher also worked for the Bureau of Economic Geology, participated in student government, and became a member of several student organizations.

Still young . . . This young dynamo—he'll be 37 on March 12—was born in Gainesville, Tex. His folks moved shortly after Gordon's birth, and he spent most of his boyhood in the Rio Grande Valley of the Longhorn state. His scholastic ability showed up early. No. 1 in grades, he was named the outstanding student during his senior year at high school in San Benito.

After his Texas U. successes, which included besides A's, two letters each in both track and cross country, he joined Rycode Oil Corp. in Houston. He left the Houston company a month later and started to work for Phillips Petroleum Co. at Bartlesville, Okla.

Fisher designed crude-oil stabilization and distillate-recovery plants for Phillips. He also took a crack at the economic department where he did reservoir engineering and reserve determination.

While with Phillps from March 1, 1939, to October 1, 1941, he continued his studies. In 1941, he received a M.S. degree in petroleum engineering with a minor in geology from his alma mater.

Goes to Gulf . . . Fisher switched allegiances in 1941 and joined Gulf Oil Corp. at Fort Worth. He started in the geological department and stayed there until September 1946 when he was made chief petroleum engineer for the North Texas, Panhandle, and West Texas areas.

In this work he was in charge of production engineering. His duties covered secondary recovery, selection of mechanical equipment for production, production cost analyses, and all phases of engineering connected with crude-oil and natural-gas production.

In June 1950, he was named executive assistant to the vice president at Fort Worth, and manager of supply and service. His job included purchasing, warehousing, civil engineering, transportation, and administrative facets of the division operations.

He advanced to manager of production for the division in December 1951. Fisher held this job until he was hired by Plymouth to run its operations on February 1. He will live at Sinton, Tex., Plymouth's operating headquarters.

He is married and the father of three children. He also is a member of the American Institute of Metallurgical Engineers, the American Association of Petroleum Geologists, the Fort Worth Petroleum Engineers, and the Fort Worth Club.

Vernon L. Lonton, Jr., district engineer with Phillips Pipe Line Co. at Alvin, Tex., has been transferred to Bartlesville, Okla., as operations engineer.

Kenneth H. White, staff assistant in Continental Oil Co.'s transportation department, has been promoted to traffic manager for Egyptian-American Oil Co., a Continental subsidiary. His headquarters will remain at Ponca City, Okla.

Dr. Fred H. Poettmann has been named engineering supervisor for Ohio Oil Co.'s research laboratory to be located near Denver. Poettmann, a native of Germany, has been associated with Phillips Petroleum Co., American Gas Association, and Lubrizol Corp. He was chief of the production research section with Phillips before joining Ohio in January.

W. R. Gannaway, geologist with Sun Oil Co., has been transferred from Philadelphia to Tulsa.

Harold C. Rose and **Murdo MacIver** have been elected directors of California Texas Oil Co., Ltd. Both men have been serving with the company as vice presidents.

Robert P. Evans, former assistant regional geologist with Lion Oil Co. at Bismarck, N. D., has been transferred to northern area supervisor in charge of the land and geological department. He will headquarter at Billings, Mont.

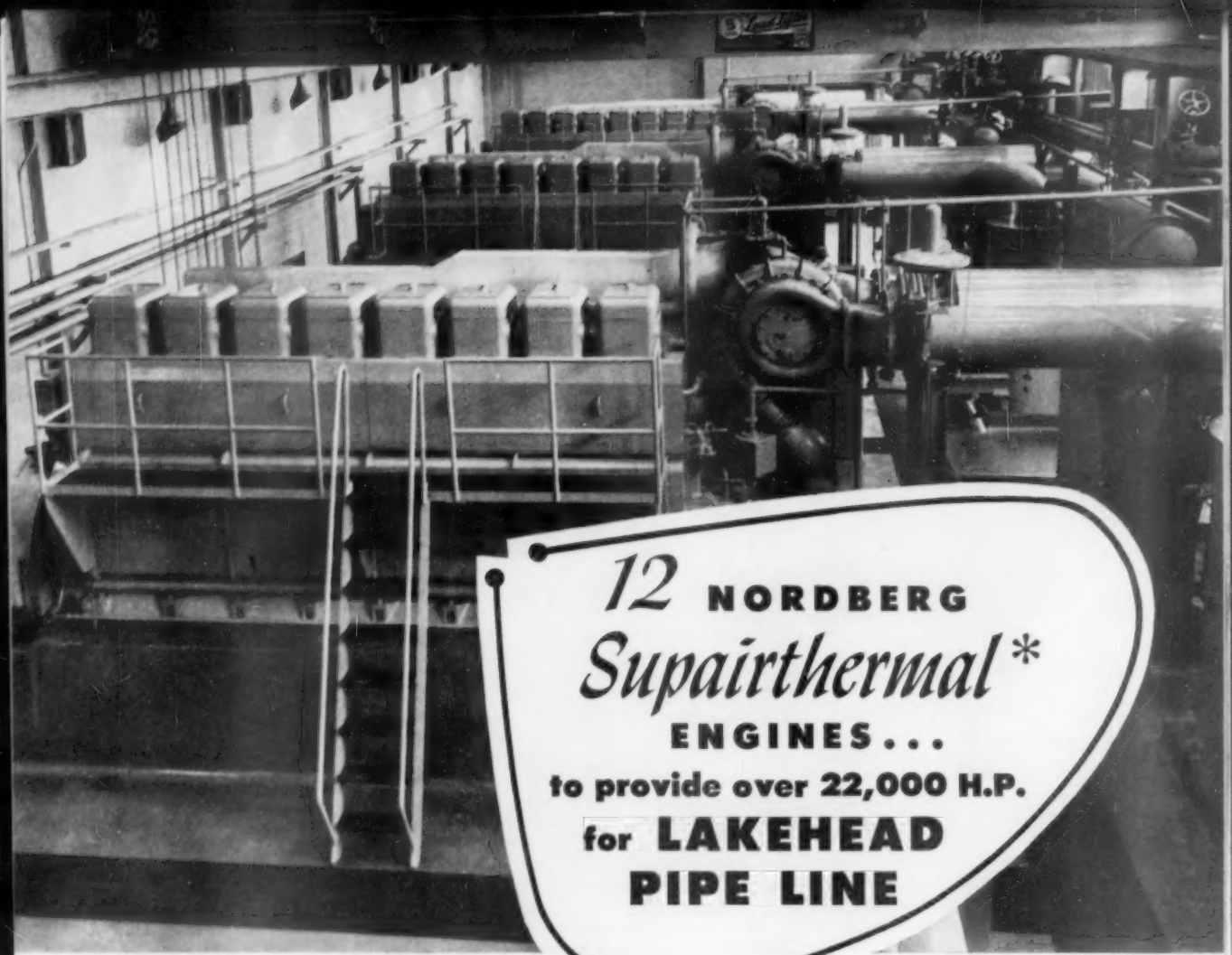
E. C. INGHRAM

Edward C. Inghram has been elected vice president of New York State Natural Gas Corp. Inghram, a 23-year veteran with New York Natural, will continue to serve as general superintendent of the firm. Inghram supervised the initial work on the Oakford, Pa., storage pool, joint development of New York Natural and Texas Eastern Transmission Co. **Donald L. Barger** has been named superintendent of production and transmission for the company. Barger, a 19-year veteran of the firm, has been serving as assistant superintendent of production and transmission since 1951. **Robert S. Jefferies** has been promoted to chief engineer of New York Natural. He has been serving as chief mechanical engineer of the firm since 1952.

D. L. BARGER

R. S. JEFFERIES

Patrick Mask has been elected sales vice president of Somerville Construction Co., of Ada, Mich. Mask, who has been with the company for 15 years, started as a foreman in Michigan gas field installations. **Joseph Czajkowski** has been elected administrative vice president. He will act as administrative officer for the main office and all project offices. Reelected to their offices were **R. B. Somerville,** president;



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TWELVE powerful, compact Nordberg four-cycle *Supairthermal* Engines will provide a total of 22,680 hp for pumping stations along the Lakehead Pipe Line Company line from the Canadian border to Superior, Wisconsin, and from there to Sarnia, Ontario.

Six of these Nordberg engines, such as the three shown in the view above, are each rated 1780 hp, for the Lakehead extension line from Superior to Sarnia. The other six *Supairthermal* pumping engines, each rated 2000 hp, will be installed in pairs in three stations on the pipe line from the Canadian border to Superior.

This is one more outstanding example of the ever-increasing use of Nordberg *Supairthermal* Engines, in Diesel, Duafuel® and Spark-Ignition Gas types, from 535 to 5000 hp, to provide compact, heavy duty, economical power for the petroleum industry. Write for further information, outlining your power requirements.

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PERSONALS

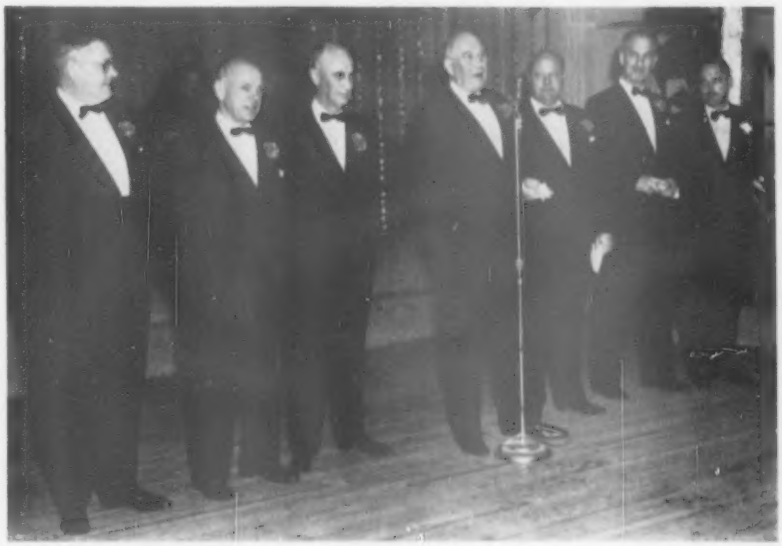
Robert J. McBain, executive vice president; and **Marie Somerville,** secretary-treasurer.

Earl M. Burch has been named manager of exploration and development by Century Refining Co., Inc. Burch has been active as a geologist in the petroleum industry for 18 years. He has served with National Cooperative Refinery Association, Stanolind Oil & Gas Co., El Dorado Refining Co., and Shell Oil Co.

Louis C. Gibbons has been named supervisor of the chemistry section of Ohio Oil Co.'s research laboratory at Littleton, Colo. Gibbons joined Ohio in January. He previously served as associate chief of fuels and combustion research for the National Advisory Committee for Aeronautics.

Thomas S. Bacon, chief engineer of Lone Star Gas Co.'s transmission division, has been appointed director of the company's new research and development department. Bacon joined the Lone Star organization in 1931 as a research engineer. He was named chief engineer of the transmission division in February 1947.

D. C. Rhodes, district superintendent of Goose Creek district of the Gulf Coast division of Humble Oil & Refining Co., has been promoted to assistant division superintendent. Other promotions and transfers announced by Humble include: **R. H. Ussery,** district superintendent of Bayou Sale district of Louisiana division, transferred to Goose Creek district; **W. J. Barrett,** district superintendent of the recently discontinued Aransas Bay district in the Southwest Texas division, transferred to Bayou Sale; **John Paul Nolley,** assistant district superintendent of Stratton district in Southwest Texas division, moved to Means district in West Texas division as assistant district superintendent; **G. C. Pray,** roustabout gang-pusher of North Crowley district of the Louisiana division, promoted to farm boss at North Crowley; **John G. Jackson, Jr.,** senior petroleum engineer, Southwest Texas division office, transferred to Louisiana division as senior petroleum engineer; **John H. Pittman,** senior civil engineer, Gulf Coast division office, moved to the gas construction division office as senior civil engineer; **J. P. McAdams,** district petroleum engineer of North Katy district of Gulf Coast division, transferred to Gulf Coast division office as senior petroleum engineer; **C. W. Armstrong, Jr.,** district petroleum engineer of Maurbro district of Gulf Coast division, moved to North Katy district as district engineer; and **F. A. Keilberg,** farm boss of the Thompsons district of Gulf Coast division, transferred to North Katy district as farm boss.



Tulsa Nomads Elect 1955 Officers at Inaugural Ball

The Tulsa Chapter of Nomads installed its officers for the 1955 year at the chapter's annual inaugural ball. There were 336 members and guests present. Officers named for 1955 are, left to right: John Pearce, Superior Iron Works & Supply Co., assistant treasurer; R. C. Glover, Baker Oil Tools, Inc., senior regent; Don L. Collins, Republic Supply Co., junior regent; G. F. Coons, National Tube Division of U. S. Steel, senior regent, who acted as master of ceremonies; Jack H. Beesley, Baroid Division of National Lead Co., vice president; Guy F. Williams, Dowell, Inc., assistant secretary; and E. J. Handley, Midwestern Geophysical Co., deputy sergeant-at-arms. Gilbert Swift, Wells Surveys, Inc., president; Paul V. McGivern, McKissick Products Corp., sergeant-at-arms; Oscar Irizzary, editor of Petro'eo Interamericano, secretary; and Cecil C. Crider, Bethlehem Supply Co., treasurer, were unable to attend the inaugural.

New N.G.A.A. Committee Holds First Meeting

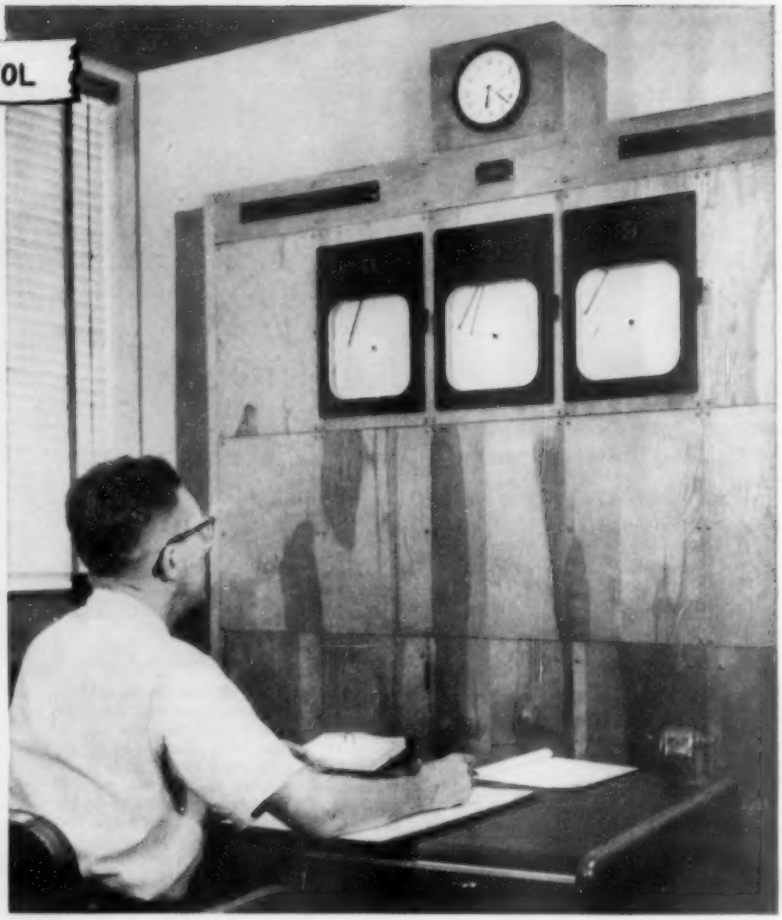
The Natural Gasoline Association of America's new committee on equilibrium ratios recently held its first meeting in Tulsa. Seated, left to right, are J. W. Kilmer, Elliott Organick, Blaine B. Kuist, Karl H. Hachmuth, and William Leggett. Standing are Charles E. Webber, C. L. De Priester, H. H. Rachford, Byron B. Woertz, and Robert Jacoby.

John C. Whitaker, former geologist with Standard Oil Co. of California, has resigned to accept a position with Lundberg Explorations, Ltd., as a geologist.

R. C. Marmaduke, staff geologist of British-American Oil Producing Co. in Dallas, has been promoted to division geologist of the central division with headquarters at Oklahoma City. **H. A. Sykes,** former geologist with British-American in the Oklahoma City office, has been promoted to district geologist

WHAT'S NEW AT BRISTOL

Bristol helps him watch 1000 miles of pipeline



THREE BRISTOL METAMETER* RECEIVERS in the Houston, Texas, office of the Trunkline Gas Company, show the static and differential pressure of gas at Bourbon, Illinois, over 1000 miles away, Oretta, Louisiana, and Edith, Louisiana. Readings are sent by microwave from these points to the Bristol receivers, where even the slightest variation in flow or pressure is recorded.

*Reg. U. S. Pat. Off.

STRETCHING FROM TEXAS INTO ILLINOIS, the Trunkline Gas Company line crosses Louisiana, Arkansas, Tennessee and Kentucky. Microwave stations all along the way speed pressure readings to the Metameter Telemeters at the main office in Houston. Because they wanted the finest, Trunkline Gas selected Bristol, the acknowledged leader in telemetering, to supply the necessary recording equipment.

Find out how Bristol's 60 years of instrument experience can help you, too. Write for Bulletin M-1710 to The Bristol Company, 120 Bristol Road, Waterbury, Conn.

BRISTOL

LOOK FOR OUTSTANDING NEW DEVELOPMENTS FROM BRISTOL

THE DEPENDABLE GUIDEPOST OF INDUSTRY

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

PERSONALS

in the Ardmore, Okla., district **W. H. Speckhard** has joined British-American as head of the newly formed geophysical department of the central division at Oklahoma City.

T. B. Kimball, manager of refineries of Sinclair Refining Co., has been elected a vice president of the company. Other recently named vice presidents are **W. M. Flowers,** president of Sinclair Research Laboratories, Inc.; **C. R. Campbell,** assistant general sales manager, wholesale sales; and **A. J. Geary,** manager of export sales.

Charles M. Stone has been promoted to assistant chief engineer of Colorado Interstate Gas Co. Stone joined the company in June 1954. Before going with the company, he was employed by Stearns-Roger Manufacturing Co. as a designer of facilities for processing and transmitting natural gas. Prior to joining Stearns-Roger, he had served for 7 years with The Texas Co. as a research and refinery engineer.

Dr. I. Bergsteinsson, former senior research chemist for Union Oil Co., has been named senior market research and development engineer for Brea Chemicals, Inc., subsidiary of Union.

D. M. McBRIDE

D. M. McBride has been promoted to manager of Phillips Petroleum Co.'s supply and transportation department. McBride, a veteran of 26 years with Phillips, has been in the supply and transportation department for 8 years. Other promotions in the department include: **John E. Harris, Jr.,** named to succeed McBride as manager of crude oil purchases and sales, and **G. J. Derrick,** promoted to general traffic manager.

L. A. McCrummen has been named field superintendent by Stanolind Oil & Gas Co. in the Little Buffalo basin area of Wyoming. McCrummen, a veteran of 20 years of service with Stanolind, recently held supervisory positions at the South Houston and Hastings areas in Texas.

M. C. Welch has been named assistant district superintendent of California operations by Sunray Oil Corp. A 25-year veteran in the Sunray organization, Welch will be in charge of coordinating and directing the activities of the producing, drilling, gas and gasoline, and mechanical sections of the production department.

Stanley Harlow has been named vice president in charge of drilling and production of Harlow Petroleum Co., of Tulsa.

DEATHS

John Greer Bartram, 61, consulting geologist for Stanolind Oil & Gas Co., died February 18 in Casper, Wyo., after suffering a heart attack in his Pullman car. Bartram, who lived in Tulsa, began his oil career in 1916 as a geologist with Roxana Petroleum Co. He left Roxana in 1923 and joined Midwest Exploration Co., where he remained until 1931. He transferred to Stanolind in 1931 and became a division geologist with the firm at Casper. He moved to Tulsa as division geologist in 1939 and was promoted to assistant manager of the exploration department in 1944. He became manager of the exploration department in 1947. He assumed his last position as consulting geologist in 1950. He served as the petroleum industry's only representative on a committee on exploration for rare materials sponsored by the National Science Foundation. He was also a distinguished lecturer for the American Association of Petroleum Geologists and a member of the American Petroleum Institute's committee on oil reserves.

T. J. O'Brien, veteran Kansas and Oklahoma oil man, died recently at his home in McPherson, Kans., after a year's illness. O'Brien was state superintendent for Cosden Oil Co. in Kansas and Oklahoma for years. About 16 years ago he moved to McPherson as Kansas production superintendent for Aladdin Oil Co.

Gordon Allen, 49, sales representative for Magnet Cove Barium Corp., died recently in Shreveport. Allen, a veteran of more than 25 years of service in oil-field service and supply work in the Ark-La-Tex area, had been employed by Magcobar since 1950.

John Rodgers Moroney, 55, Dallas oil man, died recently in Dallas. Moroney was president of Petroleum Southwest Co. and Petroleum Royalty Corp.

Thomas S. Doran, oil producer of southern Illinois, was killed recently in an automobile accident near Mount Vernon, Ill.

Raymond Godet, widely known French oil man and operator of Forex, the only oil drilling firm in France, died recently in Paris. Godet started his petroleum career shortly after World War I when he served in Romania and Russia as an engineer for Petrofina, the French and Belgian company. When he returned to France, he built one of the largest French refineries at Berre and stayed as its manager until 1940. Godet's long-time belief that France had a future as an oil country has been proved somewhat by recent Esso Standard discoveries near Parentis.

Clarence E. Roth, 85, pioneer oil and gas producer, died recently at his home in Independence, Kans. Roth started in the oil business in 1903 and drilled more than 800 wells in Kansas, Oklahoma, Texas, and Canada. His biggest strike was the Thrall pool in Greenwood County, Kansas. It was later bought by Prairie Oil & Gas Co.

Teodol Theodoli, 72, managing director of Caltex Oil Co. (Italy) S.p.A., died recently in Rome. Theodoli joined The Texas Co. in 1919 and was assigned in 1920 to help organize Texaco's Italian subsidiary which became a part of the Caltex group after World War II.

Ronald S. Drysdale, 72, a leading authority in the cutting-oil field, died February 20 at his home in Philadelphia. He had been ill for several months. He had served as special representative in charge of cutting oils for Sun Oil Co. since 1920.

Oliver S. Ambrose, 71, former manager of the economics and petroleum analysis department of Tide Water Associated Oil Co., died recently at San Francisco after a long illness. He joined Tide Water in 1920 as a construction engineer at its Drumright, Okla., refinery.

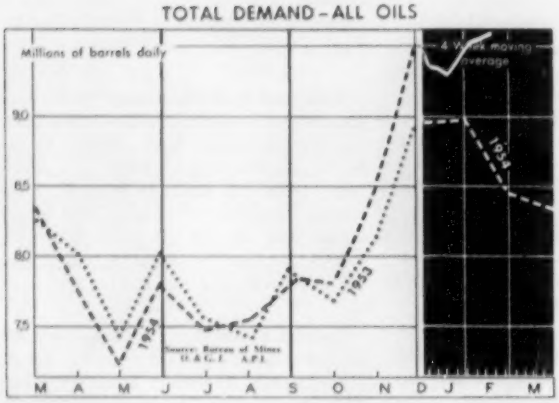
Henry A. Rosenberg, 57, president of Crown Central Petroleum Corp., died February 23, at Eccleston, Md., after suffering a heart attack.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,771,100	UP	22,650	UP	402,010
Crude stocks	260,925,000	UP	781,000	DOWN	5,178,000
Completions	1,014	UP	122	UP	102
Refinery runs	7,511,000	UP	127,000	UP	355,000
Gasoline stocks	176,877,000	UP	2,674,000	UP	1,380,000
Distillate stocks	71,019,000	DOWN	5,139,000	UP	1,832,000
Four-product stocks	314,776,000	DOWN	3,712,000	UP	4,845,000
Total imports	1,270,800	DOWN	78,200	DOWN	17,900

TOTAL DEMAND - ALL OILS



Comparison of February Demand With Last Year May Give a False Picture

CURRENT refinery reports indicate that demand for petroleum products is running well above corresponding weeks of February last year. This is particularly true for distillate fuels. Total demand for kerosine and distillate fuels averaged about 3,320,000 bbl. daily for the 2-week period ended February 11 or about 30 per cent more than the average for all of February 1954.

There are several factors that must be considered in any comparison of recent demand and averages for last year. First, heating-oil demand in the early part of February was boosted by actual consumption in the last half of January.

Also, a comparison of recent demands with averages for last February must take into consideration the fact that demand was abnormally low in February 1954.

The accompanying tables show that the entire winter demand a year ago was much below normal because of warm weather. In addition to the over-all lack of demand, last February was even lower than the other winter months.

Note in the first table that demand for all oils during the winter months of 1953-54 was only 0.2 per cent more than demand a year earlier. Except for the winter of 1948-49, last heating season had the smallest increase since the end of the war. Middle distillate demand was up only 6,000 bbl. daily.

Table 2 shows comparisons for all oils and distillates by months for postwar heating seasons and the winter of 1953-54. Demand for each month is expressed as a per cent of the daily average for the entire winter season. In the postwar period, February demand for all oils was 101.8 per cent of the average winter demand. For the winter of 1953-54, February demand was only 100.7 per cent of the season's average.

For middle distillates, demand last February was only 104.5 per cent of the season's average when it should have been 111.7 per cent, according to the postwar trend.

Take current high percentage gains with a grain of salt.

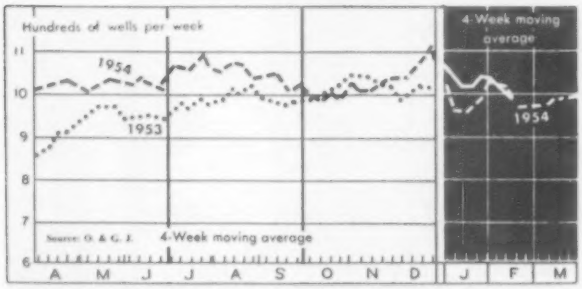
WINTER DEMAND—OCTOBER THROUGH MARCH
(Thousands of barrels daily)

	All oils	Per cent increase	Middle distillate	Per cent increase
1946-47	5,748	11.4	1,338	16.9
1947-48	6,303	9.7	1,596	19.3
1948-49	6,256	—0.7	1,557	—2.4
1949-50	6,648	6.3	1,668	7.1
1950-51	7,537	13.4	1,984	18.9
1951-52	8,001	6.2	2,206	11.2
1952-53	8,400	5.0	2,307	4.6
1953-54	8,420	0.2	2,313	0.3

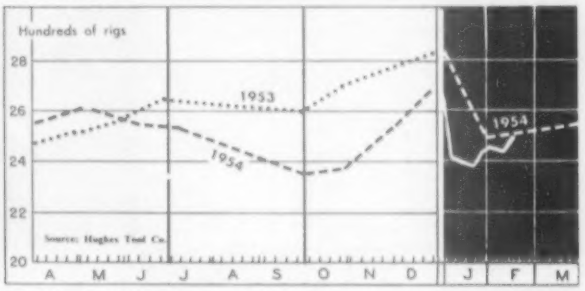
WINTER DEMANDS BY MONTHS
(Each month as per cent of winter's average)

	All oils		Middle distillate	
	Postwar	1953-54	Postwar	1953-54
October	93.3	90.9	68.5	61.6
November	97.1	96.1	88.5	83.7
December	105.1	106.2	114.8	117.6
January	103.4	106.7	120.5	133.0
February	101.8	100.7	111.7	104.5
March	99.5	99.4	96.7	96.9

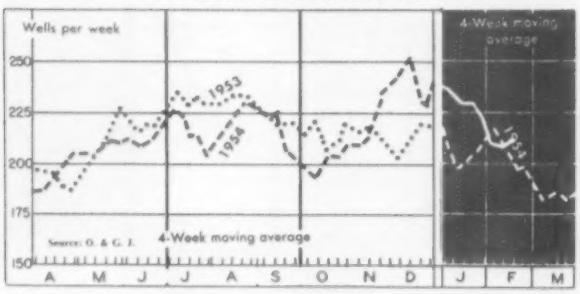
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	2-21-55	Change from 2-14-55	Change from 2-22-54
Gulf Coast	538	19	21
N. and W. Texas-New Mexico	838	14	58
Arkansas-N. Louisiana-E. Texas	172	1	—9
Oklahoma	298	3	—75
Kansas-S. Nebraska	183	15	33
Illinois-Eastern	121	—2	—12
Rocky Mountain	202	8	—39
Pacific Coast	145	4	2
Total United States	2,497	62	—21
Western Canada	208	13	65

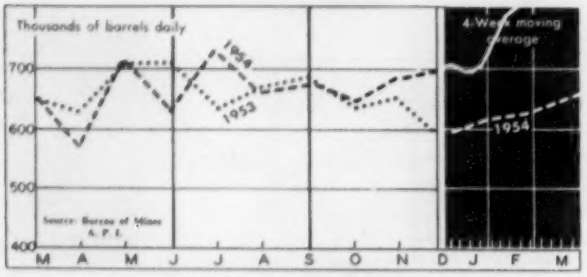
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . .WEEK ENDED FEBRUARY 19, 1955

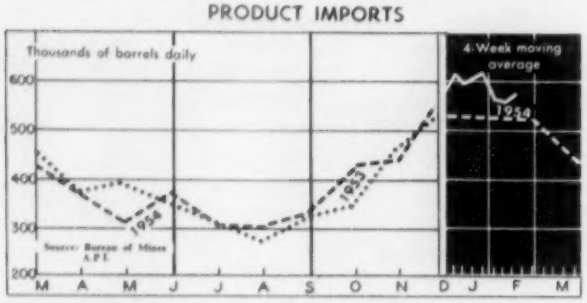
	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1955				
	Comp.	Oil	Gas	Dry	Footage	1955	1954	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	3	0	0	3	9,804	19	18	0	0	0	3	3	0	0	0	18	18
Arkansas	15	8	0	7	43,120	65	75	2	0	0	4	6	6	0	0	15	21
California	41	31	2	8	130,901	262	345	1	0	0	5	6	4	0	1	44	49
Colorado	18	5	0	13	100,803	166	138	0	0	0	8	8	7	0	4	84	95
Illinois	56	33	0	23	143,134	529	365	0	0	0	7	7	10	0	0	61	71
Indiana	8	2	1	5	14,695	75	109	0	0	0	1	1	2	0	0	19	21
Kansas	95	65	6	24	339,568	670	550	6	0	0	13	19	20	0	4	115	139
Kentucky	20	8	0	12	29,516	172	145	1	0	0	6	7	8	0	1	31	40
Louisiana	92	58	10	24	645,696	530	435	5	2	0	11	18	21	8	4	52	85
North	43	29	3	11	129,807	281	215	0	0	0	5	5	3	2	1	23	29
South	49	29	7	13	515,889	249	220	5	2	0	6	13	18	6	3	29	56
Michigan	9	2	0	7	26,307	87	93	0	0	0	5	5	1	0	0	37	38
Mississippi	6	3	0	3	62,965	51	38	0	0	0	1	1	0	0	0	19	19
Montana	4	2	0	2	21,618	50	36	0	0	0	2	2	1	0	0	14	15
Nebraska	11	1	0	10	61,493	80	50	0	0	0	9	9	4	0	0	44	48
New Mexico	20	16	4	0	109,866	147	197	1	0	0	0	1	2	1	0	12	15
Northwest	2	0	2	0	4,306	40	60	0	0	0	0	0	1	0	0	3	4
Southeast	18	16	2	0	105,560	107	137	1	0	0	0	1	1	1	0	9	11
North Dakota	2	1	0	1	11,529	26	30	0	0	0	0	0	0	0	0	4	4
Ohio	19	8	7	4	45,879	146	125	0	0	0	0	0	0	0	2	5	7
Oklahoma	161	99	3	*59	587,046	1,025	1,242	1	0	1	6	8	17	2	4	77	100
Pennsylvania-New York	34	10	10	†14	75,319	241	337	0	0	0	0	0	0	0	4	3	7
Texas	374	228	5	141	1,664,896	2,521	2,368	14	2	0	95	111	101	12	13	537	663
Southwest (1 & 4)	74	35	0	39	274,505	407	337	2	0	0	29	31	16	4	3	98	121
Gulf Coast (2 & 3)	53	31	0	22	369,168	354	377	4	2	0	16	22	11	8	8	98	125
East (5 & 6)	17	8	1	8	98,028	159	87	0	0	0	6	6	6	0	0	45	51
North Central (7-B & 9)	128	73	1	54	381,575	798	872	5	0	0	33	38	47	0	0	190	237
West (7-C & 8)	84	67	1	16	485,029	657	571	3	0	0	11	14	21	0	1	103	125
Panhandle (10)	18	14	2	2	56,591	146	124	0	0	0	0	0	0	0	1	3	4
Utah	0	0	0	0	0	5	8	0	0	0	0	0	0	0	0	4	4
West Virginia	13	5	6	2	33,406	92	73	0	0	0	0	0	0	0	2	3	5
Wyoming	13	11	0	2	64,256	123	228	0	0	0	0	0	1	0	1	25	27
Miscellaneous	0	0	0	0	0	5	6	0	0	0	0	0	0	0	0	5	5
Total United States	**1,014**	596	54	364	4,221,817	7,087	7,011	31	4	1	176	**212**	205	23	40	1,228	1,496
Total previous week	892	498	49	345	3,863,518			25	6	4	168	203	174	19	39	1,052	1,284
Total February 20, 1954	912	506	72	334	3,863,037			17	1	7	149	174	189	22	45	1,264	1,520

Service wells included: *4, †7.

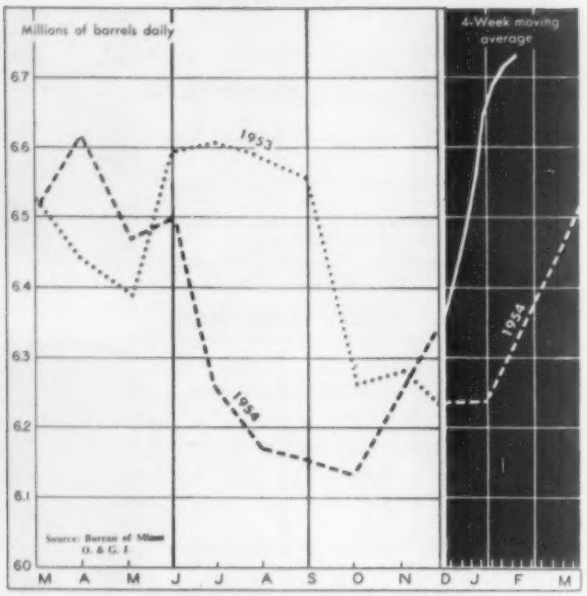
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION

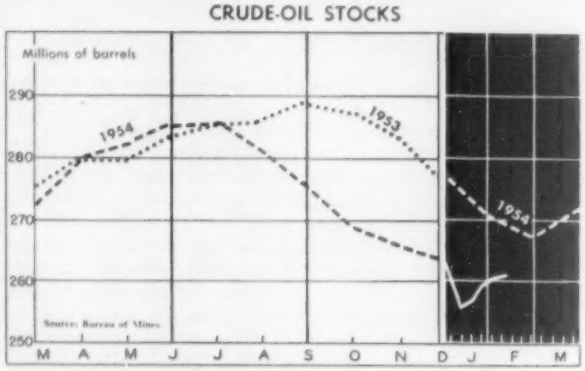


DAILY AVERAGE PRODUCTION FOR WEEK

	February 19			Feb. 12
	Crude oil	Lease condensate	Total	total
Alabama	4,100		4,100	4,200
Arkansas	72,600	400	73,000	74,950
California	966,900		966,900	967,400
Colorado	142,300		142,300	143,700
Eastern	48,500		48,500	51,900
Florida	1,450		1,450	1,450
Illinois	205,700		205,700	207,100
Indiana	28,500		28,500	30,200
Kansas	330,500		330,500	329,200
Kentucky	40,600		40,600	40,700
Louisiana	651,100	56,000	707,100	706,100
North	107,100	3,000	110,100	109,100
South	544,000	53,000	597,000	597,000
Michigan	32,500		32,500	31,800
Mississippi	90,850	4,025	94,875	94,875
Montana	42,600		42,600	43,200
Nebraska	27,600		27,600	26,900
New Mexico	219,300	4,075	223,375	222,975
North Dakota	30,100		30,100	29,700
Oklahoma	563,500		563,500	532,800
Texas	2,880,500	53,300	2,933,800	2,933,800
Dist. 1	49,500	500	50,000	50,000
Dist. 2	149,000	8,100	157,100	157,100
Dist. 3	450,000	25,075	475,075	475,075
Dist. 4	252,000	6,075	258,075	258,075
Dist. 5	47,500	550	48,050	48,050
Dist. 6	123,500	5,600	129,100	129,100
East Texas Field	236,000		236,000	236,000
Dist. 7-B	140,000	50	140,050	140,050
Dist. 7-C	183,000	4,700	187,700	187,700
Dist. 8	970,000	2,000	972,000	972,000
Dist. 9	194,000	575	194,575	194,575
Dist. 10	86,000	75	86,075	86,075
Utah	4,100		4,100	4,000
Wyoming	269,700		269,700	271,200
Others	‡300		‡300	300
Total U. S.	6,653,300	117,800	**6,771,100**	6,748,450
Change from previous week, up			**22,650**	
Canada	†348,501		†348,501	†300,975
Total U. S. production January 1-February 19			334,197,800 bbl.	
Same period last year (crude plus cond.)			*314,602,775 bbl.	

*Includes 5,066,700 bbl. condensate. †Week ended previous Monday. ‡S. D. 100, Nev. 200.

CRUDE-OIL STOCKS



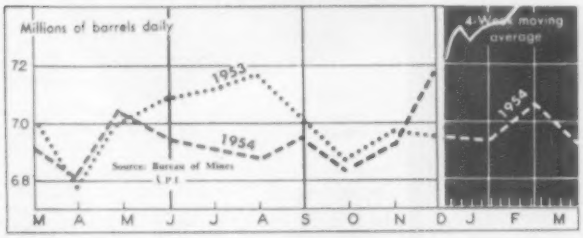
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

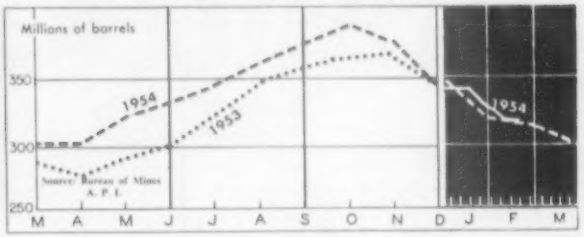
	Feb. 12, '55	Feb. 5, '55	Feb. 13, '54
Pennsylvania Grade	2,953	2,942	2,576
Other Appalachian	1,617	1,731	1,609
Illinois, Indiana, Michigan	11,725	11,105	11,604
Nebraska, N. Dakota	1,868	2,123	(‡)
Kansas	8,686	8,359	10,131
Oklahoma	23,817	24,011	26,764
Arkansas	3,023	3,071	3,280
Louisiana	14,808	14,941	14,932
North	2,304	2,463	2,634
South	12,504	12,478	12,298
Mississippi	3,414	3,205	3,370
New Mexico	8,590	7,980	8,131
Texas	117,800	118,029	123,844
East Texas proper	10,371	9,941	11,122
West Texas	50,637	51,302	53,143
Texas Gulf	24,376	23,793	25,871
Other Texas	32,416	32,993	33,708
Wyoming	14,058	14,641	11,496
Other Rocky Mountain	5,273	5,659	4,959
California	32,188	31,414	33,218
Foreign	†11,105	10,933	10,189
Total	260,925	260,144	266,103

*Bureau of Mines. †Includes 3,226,000 bbl. in California. ‡Included with Kansas.

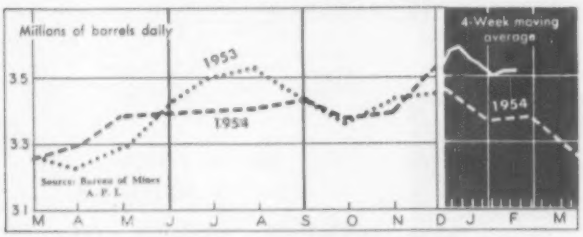
REFINERY RUNS



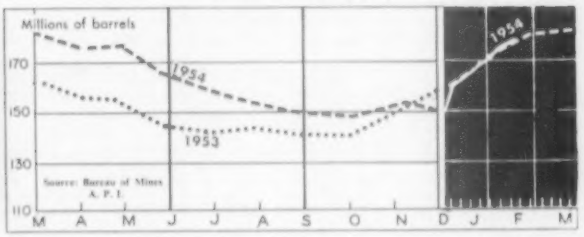
FOUR-PRODUCT STOCKS



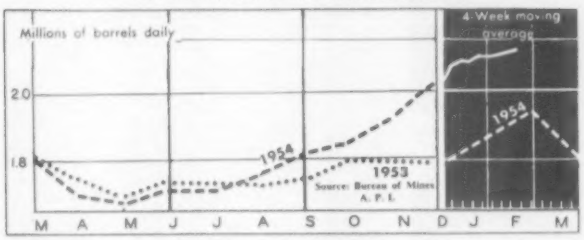
GASOLINE PRODUCTION



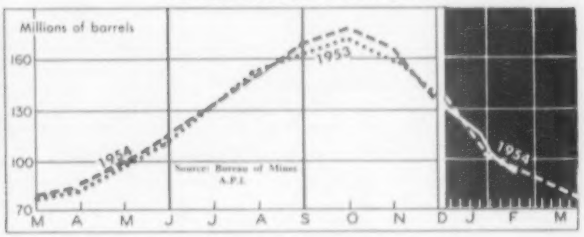
GASOLINE STOCKS



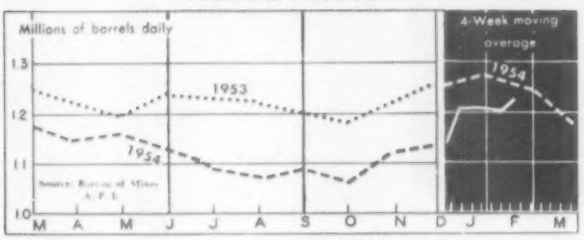
MIDDLE-DISTILLATE PRODUCTION



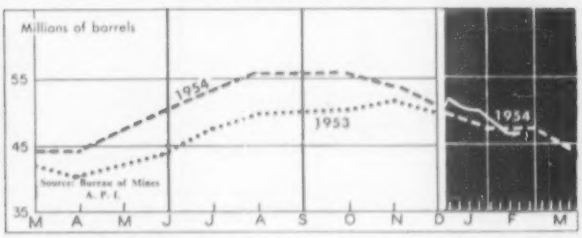
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, FEBRUARY 18

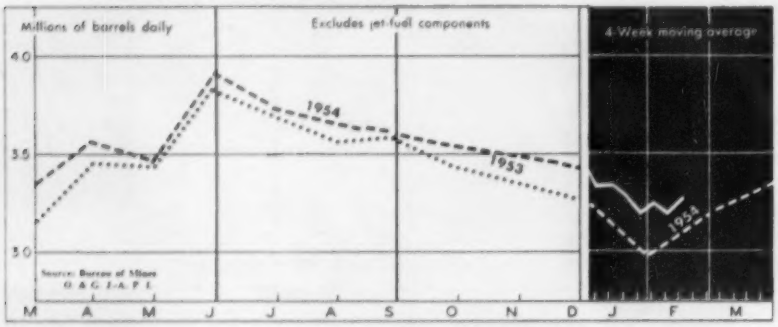
(Excludes all jet-fuel components)

(Thousands of barrels)

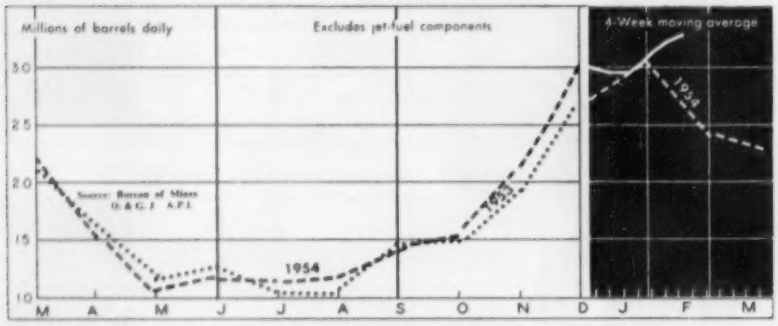
District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, February 1954—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	1,089	430.0	35.1	290.4	250.4	35,076	7,953	24,131	8,118	1,017	412.2	46.1	265.9	231.2
Appalachian:														
District 1	99	40.1	4.9	25.3	7.6	5,070	468	1,565	347	117	52.6	5.9	28.2	15.7
District 2	89	44.2	5.4	19.6	15.0	2,439	254	529	209	96	50.7	6.8	18.7	15.9
Ind., Ill., Ky.	1,372	698.4	86.4	310.3	189.8	39,654	5,230	11,448	2,807	1,334	701.9	83.9	264.5	192.7
Okla., Kans., Mo.	678	397.0	17.0	175.4	49.6	18,781	1,204	7,990	1,161	594	346.2	16.9	139.1	46.2
Inland Texas	246	176.3	10.6	38.7	20.1	6,353	302	1,121	1,289	251	175.6	12.5	42.0	29.3
Texas Gulf Coast	1,870	780.9	131.6	498.3	244.3	25,003	2,229	7,510	4,698	1,701	741.4	140.7	410.1	227.6
La. Gulf Coast	659	307.7	53.3	183.8	29.0	11,479	1,256	3,136	1,144	581	269.8	80.1	149.3	45.7
N. La. and Ark.	87	30.7	8.3	18.3	6.6	4,094	696	1,203	170	87	36.9	8.6	19.7	7.1
Rocky Mountain:														
New Mexico	18	10.4	1.0	2.9	2.7	177		85	29	19	11.9	.7	3.1	2.9
Other Rocky Mtn.	252	118.6	4.3	62.7	38.6	7,785	208	2,035	762	245	125.7	4.6	55.8	43.0
California	1,052	452.0	5.4	180.0	421.3	20,966	370	10,266	25,986	1,026	440.5	5.4	148.5	383.9
Feb. 18, 1955	7,511	3,486.3	363.3	1,805.7	1,275.0	176,877	20,170	71,019	46,710	7,068	3,365.4	412.2	1,544.9	1,241.2
Feb. 11, 1955	7,384	3,601.1	372.6	1,794.4	1,237.6	174,203	21,438	76,158	46,689					
Feb. 20, 1954	7,156	3,428.3	423.7	1,562.1	1,224.7	175,497	19,032	69,187	46,215					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

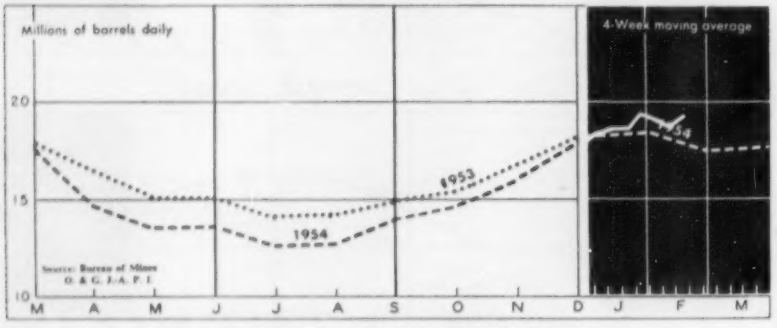
TOTAL GASOLINE DEMAND



TOTAL MIDDLE-DISTILLATE DEMAND



TOTAL RESIDUAL DEMAND



REPRESENTATIVE QUOTATIONS

Spot-market quotations of leading suppliers as of February 23, 1955. Prices are in cents per gallon, except for residual in dollars per barrel and wax in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline	10.25-11	11.25-12	10.50-10.75
Premium gasoline	11.25-12	13-13.75	11.50-11.75
42-44 w.w. kerosine	9.625-9.875	10.7	9.5-9.75
No. 2 straw fuel oil	8.75-9.0	9.95	9.0-9.25
No. 6 residual	$1.50-1.60	$2.35-2.45	$1.95-2.00

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	5.0	4.0	4.75
Grade 18-55	6.0	4.9	5.75

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	18
200 vis., No. 3 neutral, 0-10 pp.	13.25

WAX

Mid-Continent

132-134 A.M.P.	6.0

• Colder weather in the North Central states resulted in heavy distillate movement out of pipeline terminals, but no price changes were reported. Grade 26-70 natural gasoline dropped to 4.0 cents in North Texas, effective February 22. No Group 3 sales at lower prices were reported Wednesday, but reduction is expected.

PRODUCTION AND DEMAND—MAJOR PRODUCTS

(Thousands of barrels daily)

	Refinery prod.	Total demand
Gasoline:		
Four weeks ended 2-18-55	3,513	3,235
November 1954	3,428	3,505
January 1954	3,354	2,985
February 1954	3,365	3,182
Middle distillate:		
Four weeks ended 2-18-55	2,152	3,261
November 1954	1,976	2,246
January 1954	1,857	3,076
February 1954	1,957	2,417
Residual fuel:		
Four weeks ended 2-18-55	1,229	1,920
November 1954	1,120	1,613
January 1954	1,271	1,831
February 1954	1,241	1,753

CRUDE PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.*	Okla-homa, Kansas	Gulf Coast Tex.†	West Tex.‡
14-14.9	$1.87			
15-15.9	1.93			
16-16.9	1.99			
17-17.9	2.05			
18-18.9	2.11			
19-19.9	2.18			
20-20.9	2.24	$2.50		$2.37
21-21.9	2.30	2.52		2.39
22-22.9	2.37	2.54		2.41
23-23.9	2.45	2.56		2.43
24-24.9	2.53	2.58	$2.91	2.45
25-25.9	2.61	2.60	2.93	2.47
26-26.9	2.69	2.62	2.95	2.49
27-27.9	2.76	2.64	2.97	2.51
28-28.9	2.83	2.66	2.99	2.53
29-29.9	2.91	2.68	3.01	2.55
30-30.9	2.97	2.70	3.03	2.57
31-31.9	3.04	2.72	3.05	2.59
32-32.9	3.12	2.74	3.07	2.61
33-33.9		2.76	3.09	2.63
34-34.9		2.78	3.11	2.65
35-35.9		2.80	3.13	2.67
36-36.9		2.82	3.15	2.69
37-37.9		2.84	3.17	2.71
38-38.9		2.86	3.19	2.73
39-39.9		2.88	3.21	2.75
40 and above		2.90	3.23	2.77

*Standard Oil Co. of California. †Upper Texas Gulf Coast. ‡Sour. Includes New Mexico Permian.

Effective dates: California, February 16, 1953; east of California, June 15, 1953; Pennsylvania Grade, January 21, 1955.

FLAT CRUDE PRICES

Representative posted schedules per barrel

Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
Bradford	3.50
Middle District	3.37
Southwest Pennsylvania	3.08
West Virginia	2.97
Buckeye Grade	2.91
Zanesville Grade	2.72
Illinois Basin	2.90-2.95

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$16.00 a column inch one issue . . .
10% Discount three or more issues.

Address Classified Advertising Material: The Oil and Gas Journal, P. O Box 1260, Tulsa 1, Okla.

FOR SALE EQUIPMENT

SALES AND RENTALS of Rotary and Cable tools. E. A. Kelly, Okla. City, 3125 S. E. 29th St. Box 861, JA 5-6407.

7½ x 10 GASO Mud Pump unit with JL1335 Buda gas motor completely reconditioned. D. S. Campbell, Vinita, Okla.

STAR SPUDDER MODEL #45 for 4500' drill, 190 H.P. engine, Crawler type mounting, complete for $4250.00. Pressey & Son, Pueblo, Colo.

CORE DRILLS, SPUDDERS, ROTARIES: New and used equipment. Everything in supplies. Fishing tools rented. Pressey & Son, Pueblo, Colo.

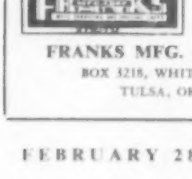
FOR SALE: In Cement, Okla., Model 66 Wichita Spudder; W.O.K. Waukesha Motor; 2 new 3000 ft. lines and drilling tools. Phone 24-J. John Baker, Cyril, Okla.

FOR SALE: 1—Beaird—Ingersoll-Rand packaged Compressor Plant, Type 6-JVG (165 H.P.) Heavy Duty, direct connected, 4-cycle, gas engine driven, single stage equipped with 3—4¼ x 9 compressor cylinders, three hand operated fixed volume pockets, two hand operated valve lifters, 20" O.D. 500# W.P. intake scrubber, air starting equipment and controls for automatic operation. Designed for intake pressure range 100#-250#, discharge pressure range 500#-600#. Delivery 3,480 MCF per day at 250# intake, 550# discharge. This plant has been in use less than 30 days and is located near Palestine, Texas. Box H-616, The Oil and Gas Journal, Tulsa, Oklahoma.

7" OD 10 V thd. Rge. 2. SS Casing, 7519.53' of 24 lb. Grade D long cplgs., and 4443.75' of 26 lb. Grade C. Pulled from Major Company wells Rodessa Field. All No. 1 and cold water tested for 3000 lbs. Stored in Kilgore, Texas. Priced at $1.35 per ft., take all. Contact PHILIP B. BERRY, Box 642, Tyler, Texas. Ph. 2-2301.

USED EQUIPMENT

Two Franks Model 4000-TM Single Drum Well Servicing Units. Single Pole Mast. Truck Mounted.
Franks Model Super East Texas Single Drum Well Servicing Unit. Truck Mounted. Handles 6500' work.
Franks Model East Texas Single Drum Well Servicing Unit. Single Pole Mast. Truck Mounted. Handles 4000' work.
Two Cardwell Models KS Single Drum Well Servicing Unit. Single Pole Mast. Industrial engine. Mounted on trucks.



50-60 Ideco Skid Servicing Unit. Double Pole Mast. Mounted on International Tandem Truck.
Franks SAL 4500 Skid Rotary Rig Cummins Power, 96' Derrick. Located, Tulsa, Oklahoma.
O.C.S. Type 3 Servicing Unit mounted on 1942 Mack Truck. Located Odessa, Texas.

Write, Wire or Call

FRANKS MFG. CORPORATION
BOX 3218, WHITTIER STATION
TULSA, OKLAHOMA

FOR SALE EQUIPMENT

ONE 36-L Bucyrus-Erie Spudder with clean-out tools. Phone 982, Augusta, Kansas.

HIGH PRESSURE CYLINDERS—4 Ingersoll-Rand Type 43K11313 4½" x 15". Have seen limited service, available immediately. Please contact Texon Gas, Inc., 2311 Liberty Bank Bldg., Oklahoma City, Oklahoma.

SALES and Rentals of cable drilling and fishing tools, casing and equipment, from the Southwest's largest stock of used cable tools and oil field supplies. Degen Pipe and Supply Co., Tulsa, Oklahoma.

BROWN FINTUBE Suction Heaters, carbon steel shell & tubes, unused, good condition. Various sizes ranging from 38 to 1100 sq. ft. Surface Area, 75 to 150 PSIG design pressure, all 500° F. design temperature. The Standard Oil Co., Midland Bldg., Cleveland 15, Ohio. Attn.: Mr. R. L. Charles.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units. Westinghouse 20-25-50 KW Generating Units.

H. H. COFFIELD
Attn.: W. H. ORR
Phones: 132—Rockdale, Texas
AT-3427—Houston, Texas

GOOD #1 GRADE USED 8" LINE PIPE FOR LESS!
Save almost ½ the cost of new pipe.

Lapweld 8⅝" O.D. 28.55 used pipe. Straight single random lengths. Machine cleaned. Plain and bevelled or screw end. 850 to 900 PSI. Pipe located in Illinois. Will sell for cash, or will finance meritorious propositions.

REDNEB PIPE CO.
P. O. Box 1798, Shreveport, La., Phone 2-3276.

FOR SALE

Complete and modern refinery, either in whole or by units, as follows:

1. 6000 bbl. topping plant with Dubbs upshot heater. Two 8x50 fractionators, salt settlers, pumps, instruments, etc., for complete operation.
2. One Dubbs cracking unit complete with 2 coil upshot heater, reaction chamber.
3. One complete steam generating unit, consisting of 2 Springfield wt boilers, feed pumps, burners, fans, stock and instruments ready to operate; boilers 415 HP each.
4. Miscellaneous items connected with refinery operation; such as, pumps tanks, vessels, fire equipment, etc.

CONTACT

W. T. Waggoner Estate,
Electra, Texas
J. O. WALKUP—Phone 3-225.

FOR SALE EQUIPMENT

7½ BY 10 GASO Mud Pump unit with JL1335 Buda gas motor completely reconditioned, also 1,000-foot rotary drill complete with tools, 15-foot drill pipe and several core barrels. D. S. Campbell, Vinita, Okla.

FOR SALE: Vessel 8' x 61'—20 Presteel Trays—50#—Suitable absorber or could be used for distillation tower. Also one power end 7¼ x 18 (18P) Oilwell or Wilson-Snyder Mud Pump. Box 1082, Wichita Falls, Texas.

FOR SALE—At Oklahoma City 1 HB-218 125# MWP Coynco Stratube open cooling sections with 1" OD x 18 BWG x 20' long Admiralty metal tubes. Purchased new March, 1951, out of service September 1, 1954. Price $850.00. Used for absorption oil cooling. Cities Service Oil, Patridge, Bartlesville, Oklahoma.

GASOLINE PLANT *FOR SALE*

Gasoline Plant, located in Brazoria County, Texas, shut down in January, 1954. Had been processing approximately thirty-three million feet of gas daily with absorber pressure approximately six hundred thirty pounds. Plant recovered Propane, Butane, Gasoline, Kerosene and Diesel Oil. Adequate storage tanks for all products. Drum Lead Blending Plant. Detailed inventory available upon request.

SOUTHERN PRODUCTION CO., INC.
P. O. Box 670, Ft. Worth, Texas

EQUIPMENT SPECIALS!

Columns: 8' x 28', 7' 6" x 56', 7' 4" x 70', 7' x 5' x 70', (2) 7' x 57' (400#), 7' x 26' SS, 6' x 53' SS. 6' x 63', 4' x 47', (250#), 2' x 75', 2' x 45' (250#).

Heat Exchangers:

(1) 1,800 sq. ft. (Adm.), (2) 1,125 sq. ft. (850 lb.), 1,000 sq. ft., 600 sq. ft. (Adm.), (5) 424 sq. ft. (Adm.), (5) 360 sq. ft., (4) 260 sq. ft.
60—Turbine and motor driven centrifugal pumps, SS & Steel, 1" x 1" to 8" x 8".
2—6-stage Pacific pumps 730 GPM.
2—Clark MA-4 150 BHP engines.
4 IR XVG-8 engines. Also 1 Clark RA-8.
Goulds 16" 10,500 GPM. Pump. 135 ft. hd.
Oliver Filters: 8' x 10', 5' 3" x 8'.
5' x 12', 4' x 6' Drum Flakers.
Lab. Petrochem Furnace.
5—300# Vessls: 10' x 35', 8' x 35', 7' x 30'.
10—10' x 40' Hor. Tanks.

Detailed circular upon request.

BRILL EQUIPMENT COMPANY
4101 San Jacinto St., Houston 4, Texas, Locust 1351
New York Office, 2401 Third Ave.,
Telephone Cypress 2-5703
Sell us your surplus equipment

FOR SALE EQUIPMENT

FOR SALE at Buffalo, Oklahoma: 2,200' of 9⅝" 36# J-55 Seamless Casing, once run. $2.50 per foot. Deep Rock Oil Corp.—Huitt—Ph. 2-4351—Tulsa.

FOR SALE—Horizontal Duplex Steam Pumps—10x8½x12—353 GPM—bronze fitted—max. discharge pressure 100 lbs.—6" suction—5" discharge—mfg. by American Marsh Co. Quantity available—NEW—Boston Metals Co. 313 E. Baltimore St., Baltimore 2, Md., Curtis 7-5050

FOR SALE—55,000' Used Line Pipe. 45,000' 4" Thin Wall, Balance 3" & 4" Std. Line Pipe. 20,000' in Yard, Balance in Ground 9" to 12" easily accessible, Purchaser to Recover. Write T. R. Powell, Onyx Ref. Co., Box 330, Abilene, Texas or Call 4-6215.

SWEET GASOLINE PLANT—Forty Million daily at 350#. Dwellings and 17 acres of land. Contact E. W. Poindexter, Columbian Carbon Company, 704 San Jacinto Bldg., Houston 2, Texas. Phone CE. 8645.

FOR SALE—We have approximately 350,000' of 2" and 3" buried oil and water lines in the El Dorado, Kansas oil fields available for take-up on percentage basis. Depth 12-18". We would sell in ground. Full details by contacting Patridge, Cities Service Oil Company, Bartlesville.

FOR SALE: ENGINE—165 Hp. Climax Model R61, maximum continuous Hp. rating 126. Herndon Drilling Company, 421 Mayo Building, Tulsa. Phone 4-9700.

USED HYDRAULIC DRILLS and Mayhew Model 1000—Gardner-Denver Pumps. Drills mounted on Fords and Internationals. Good condition. Price range from $3500.00 to $5500.00. 3820 N.W. 39th Street, Oklahoma City, Oklahoma. Phone Windsor 2-5597.

RECONDITIONED WELDER BARGAINS

G-E, Lincoln, Hobart, P&H welders completely rebuilt with new welder guarantee—immediate delivery. M-g sets—150 to 400 amps. Ac transformer—200 to 500 amps. Engine-drive dc—200 and 300 amps. 300 amp. dc generators—"build your own".

TYPICAL BARGAIN

G-E, 6WD33C, 300 amp., 40v, 440/220v, 60cy 3 ph stationary set $285—portable sets available.

Write, Wire or Phone

G. F. MEYER

Machinery & Welder Corp.

3623 W. National Ave. Milwaukee, Wis.

Mitchell 5-1790

IMMEDIATELY AVAILABLE

BOILERS—(9) 304 HP, 125 PSI, Kewanee, Firebox, ASME, Complete, (4) 50 HP, 150 PSI, Titusville.

COLUMNS—Steel, welded, w/Reboilers & Reflux Condensers—18"x41', 20"x44', 24"x45', 42"x44'.

11'x84' bubble cap, 18 trays, 100 PSI.
9'x42'6" chrome lined, 150 PSI.
6'x37'2" chrome lined, 200 PSI.

DIESELS—(3) 2160 KW Busch-Sulzer, 3/60/2400/4160 Gen., complete. New 1943. Can be seen in operation.

HEAT EXCHANGER—1530 sq. ft. Admiralty tubes.

PRESSURE TANKS—(2) 10'x40', 30 PSI.
(2) 7'x45' 13,000 gal. vert., 60 PSI.
(1) 7'x24' 7000 gal. vert., 150 PSI.
(4) 7'x22'6" 6500 gal. vert., 100 PSI.

PROPANE TANKS—(4) 30,000 gal. 200 PSI, New.

Heat & Power Co., Inc.

310 Thompson Bldg., Tulsa 3, Okla.—Phone: 3-4890

70 Pine St., New York 5, N. Y.—HAnover 2-4890

FOR SALE EQUIPMENT

COMPLETE 500 bbl. per day pump jack; 1,400 ft. 3 in. tubing and rods, and two 100 bbl. tanks with 8 by 15 gun barrel. Used 30 days. Call 2-9923. Tulsa.

FOR SALE—Damaged oil rig mounted on 2 barges. Can be repaired. Located at Saucer Marine Service, Inc., Industrial Canal, New Orleans, La., Phone VIctor 3316.

ROTARY EQUIPMENT: Gardner-Denver 7 x 14 pump, Dickerson drawworks, OWS table Block, Hook, Swivel, Hose, steel Dog House. $6250.00. Pressey & Son, Pueblo, Colo.

36-L BUCYRUS and tools from 8" to 5" incl. New 3800 ft. ⅞th line. Also plenty A-1 pipe for 3,000 ft. well. Many small tools etc. Truck, Trailer House and Cadillac. Everything is A-1 condition and ready to move on location. Best bargain yet. Be quick Like. P. O. Box 110, Chadron, Nebraska, or phone 3269 after 9 P.M.

EQUIPMENT WANTED

WANTED: Rotary, regardless of size or condition, give price. Box H-655, The Oil and Gas Journal, Tulsa, Oklahoma.

WILL PAY highest prices for used casing, used line pipe, abandoned leases, or other surplus lease equipment. Your idle producing equipment is worth dollars. Green Pipe & Supply Co., Box 1383, Tulsa, Oklahoma.

WILL CONSIDER buying or leasing used seismograph equipment and trucks. Must be in good condition and reasonably priced. Please give full description, prices and present location in first letter. Box H-565, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Double drum machine with twin pole mast capable of servicing 3000 ft. wells. would prefer Cardwell or Cooper. Robert Wharton, R.D. 3, Burgettstown, Pa.

WANTED—good used pipe suitable for low pressure gas lines. Need approximately 10,000 feet of 20", 18", 16", 10", 8", and 6". Write, wire, or call amount, condition and price to Odessa Natural Gasoline Company, P. O. Box 3908, Odessa, Texas, Phone 6-3241.

WANTED: 3 Landis Pipe Threading Machines for 4" through 13⅜" OD Pipe. Must have receding die heads—Furnish Model and Serial Number. Wire or Phone collect. Prospect 2-2100, VALLEY STEEL PRODUCTS CO. A. J. Strubel, St. Louis, Missouri.

HELP WANTED

SALES MANAGER

Man between 25 and 40 with oil field selling experience to take charge of 15 manufacturers agents soliciting business for manufacturer of portable houses for drilling rigs. Write

Box H-651, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2603, Tulsa, Okla. $5.00 cash.

WANTED: Graduate Engineer by independent oil company. Experience in drilling, completion, and workovers in the Illinois Basin. Give details of experience and salary expected. Box H-630, The Oil and Gas Journal, Tulsa, Oklahoma.

IMMEDIATE OPENING for process engineer with experience in operation and design of petroleum refining equipment. Refinery located in southwest. TCC catalytic cracking experience desirable. Write giving resume of experience, availability and salary desired. Box H-628, The Oil and Gas Journal, Tulsa, Oklahoma.

INSPECTORS ELECTRICAL & MECHANICAL

ELECTRICAL—electrical engineering degree required, plus minimum 4 years experience shop inspection, or shop supervision & testing, of oil refinery electrical equipment such as switch gears, transformers, motor starter protection & minimum 4 years field supervision on installation of such equipment. Electrical design & specification writing preferred.

MECHANICAL—mechanical engineering degree preferred, but minimum 2 years satisfactory completion mechanical engineering acceptable, plus minimum 8 years experience shop fabrication supervision, or satisfactory inspection, or combination thereof covering the following:
a) alloy, stainless, carbon steel & aluminum pipe fabrication, completely familiar with American Standard Code for pressure piping.
b) coded pressure vessels, completely familiar with API-ASME & ASME Codes with knowledge welding operations.
c) shell & tube type heat exchange equipment, completely familiar with T.E.M.A. specifications with knowledge welding operations.
d) pumps & compressors, completely familiar in detail this equipment & capable supervising & approving "witness" operational shop tests.

Please apply only if age 30 or above and providing you possess the required qualifications & experience. Interviews arranged at our expense on basis of confidential complete chronological resume, including education and employment (names and addresses of employers, dates employed, positions held & your specific duties & scope of responsibility, salaries received, location & type of jobs, etc.). Airmail data to

PERSONNEL DEPARTMENT
HYDROCARBON RESEARCH, INC.
115 Broadway New York 6, N. Y.

PROJECT ENGINEER

A large midwestern engineering and construction firm has a staff position for a qualified Engineer experienced in the petroleum and chemical industries.

This man must be capable of taking complete charge of a job; supervise engineering layouts and design, select plant equipment, coordinate purchasing and construction and maintain amiable relations with our clients.

In applying furnish a detailed resume of your education, experience and references. Address

BOX H-648,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

HELP WANTED

PETROLEUM ENGINEERS wanted by growing independent producing company in West Texas area. Must have petroleum engineering degree and from two to five years of practical experience in drilling and or production work. Salary will be commensurate with experience. Reply should describe education, experience, marital status, and salary required. Recent photo will be helpful. Interview will be arranged if qualifications meet requirements. All replies will be treated in confidence. Box H-625, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST

Active independent oil company has opening in Tulsa office for qualified subsurface geologist. Must have well-rounded experience in Mid-Continent Area, particularly Oklahoma, and must be capable of handling geological operations at divisional level. Age limit 40. Excellent position for right party. Give complete summary of experience and qualifications in letter. All replies confidential.

BOX H-650,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

CARIBBEAN REFINING CO.

New Complete Petroleum Refinery
Located near
SAN JUAN, PUERTO RICO
has immediate need for
EXPERIENCED REFINERY PERSONNEL

OPERATING SUPERINTENDENT
MAINTENANCE SUPERVISOR
SHIFT FOREMEN AND OPERATORS
Distillation, Fluid Cat. Cracking,
Gas Recovery and Cat. Poly.

CHIEF CHEMIST
Experience in product blending required.

FIRE FIGHTING AND SAFETY INSTRUCTOR

CHIEF INSTRUMENT MAN

Write, giving resume, to

Caribbean Refining Company
P. O. Box 1581, Corpus Christi, Texas

REFINERY OPERATORS
AREA SUPERVISOR
LIGHT OIL TREATING
and
GAS RECOVERY UNITS
SANTOS, BRAZIL

Extensive experience operating light oil treating & gas recovery units. Responsibility will be similar to shift foreman supervising operations & instructing Brazilian personnel in operation of these units for new 45,000 bpd refinery producing gasoline, diesel and heavy fuels by thermal cracking & catalytic polymerization.

Challenging opportunity. 18-24 months foreign employment, excellent base salary plus living allowance and production bonus. Families transported to Brazil at our expense.

Interviews arranged at our expense on basis of confidential complete chronological resume, including education and employment (names & addresses of employers, dates employed, positions held & your specific duties & scope of responsibility, salaries received, location & type of jobs, etc.). Airmail data to

PERSONNEL DEPARTMENT:
HYDROCARBON RESEARCH, INC.
115 Broadway New York 6, N. Y.

HELP WANTED

CHEMIST, Petroleum, with varied experience wanted for So. California manufacturer of industrial specialties, additives, etc. for research and/or sales. Box H-660, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER with Masters Degree, or Doctor's in Chemical, Mechanical, or Petroleum Engineering, for research and teaching in Reservoir Mechanics and related fields at rapidly growing Southwestern institution. Rank and salary open, twelve months employment possible, consulting work encouraged and available in immediate area. Applications will be kept confidential. Box H-570, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEERS, Drilling Engineers, Production and Reservoir Engineers. Positions open in Arabia. Require suitable educational background and minimum of five years experience. One year contract. No family quarters. Excellent salary and benefits. Apply in writing, furnishing full description of experience and qualifications to: American Independent Oil Co., 111 Sutter Street, San Francisco.

FOR A BETTER-PAID JOB

Production and Reservoir Engineers, Geologists, Draftsmen; Geophysicists, Party Chiefs, Computers and Field Crew Staff. WRITE US—STRICTEST CONFIDENCE.

GOOD EMPLOYMENT AGENCY
1554 California, Denver, AC 0835

CORROSION & MATERIALS ENGINEER

Must be graduate Metallurgist with 5-10 years experience in oil refinery corrosion & metallurgical work.

POSITION NEW YORK AREA
SALARY COMMENSURATE WITH EXP.
BOX H-649,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA

PLANT MANAGER

Large Mid-West Independent wants experienced man to manage operations of their Asphalt Refinery located in the Chicago area. Must have a record of successful experience in the Refining and handling of Asphalts. Salary open. Excellent opportunity for right man. Reply to

BOX H-639,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

CHEMICAL ENGINEER
UNUSUAL OPENING

Exceptional opportunity with small well established engineering firm for young chemical engineer—preferably major company or equivalent experience. Good educational background and 3 years or more experience with modern refinery processing and design, especially catalytic cracking and general refinery economics. Activities very diversified in desirable U.S. location. Some but not continuous traveling.

This position offers outstanding opportunity for ambitious and resourceful engineer who can take responsibility for many diverse activities in petroleum refining and chemical fields. Salary commensurate with ability.

Box H-632,
The Oil and Gas Journal,
Tulsa, Oklahoma

HELP WANTED

EXCELLENT OPPORTUNITY for Geologist, under 35, with established independent oil company. Outline experience and personal history. P. O. Box 2775, Dallas, Texas.

WANTED—SALES ENGINEERS

Two men with Engineering degree, or equivalent, who are interested in entering the sales field. No specific sales experience required. Real opportunity, age to 35. Leading petroleum industry manufacturer, outstanding employee benefit program. Box H-641, The Oil and Gas Journal, Tulsa, Oklahoma.

PROJECT ENGINEERS

For positions with Laboratory of major oil company to conduct research and development on drilling, production, and pipe line problems. B.S. or M.S. required. Experience on mechanical or hydraulic equipment and/or control and instrumentation for same desirable. Several needed. Salary open.

Box H-634, The Oil and Gas Journal, Tulsa, Oklahoma

WANTED
Experienced Petroleum Engineer

Specializing in study of OIL AND GAS RESERVES. Large independent oil company located in Tulsa, Oklahoma. In writing give full particulars as to personal history, academic qualifications, practical experience, references, and salary expected. All communications confidential.

BOX H-637,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

OPERATING ENGINEER
NEW YORK OFFICE

To assist in supervising office & field and domestic & foreign activities of the Operating Department.

Challenging opportunity for graduate chemical or mechanical engineer with minimum five years petroleum refining experience, preferably with contracting engineering firm.

Please airmail confidential verifiable chronological resume, including salary history, to

PERSONNEL DEPARTMENT:
HYDROCARBON RESEARCH, INC.
115 Broadway New York 6, N. Y.

SITUATIONS WANTED

ASPHALT CHEMIST, sixteen years experience all phases paving, industrials, specialties. $7500 required. Box H-657, The Oil and Gas Journal, Tulsa, Oklahoma.

LANDMAN-ATTORNEY, well qualified, widely experienced. Desires change for more opportunity. Box H-620, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, Major & Independent Company subsurface experience, Mid-continent, Rocky Mountain, Permian Basin, Gulf Coast, capable evaluating drilling deals, well completions, exploration supervision etc., well rounded field & office experience, desires connection with small active independent operator or drilling contractors, prefer Denver area or Permian Basin. Box H-654, The Oil and Gas Journal, Tulsa, Oklahoma.

REFINERY ENGINEER, equipment inspector, or mechanical supervisor. Seven years experience wide range refinery equipment. Supervisory experience. Familiar all codes, vessels, piping, etc. Turnaround planning, coordination. Maintenance, corrosion control, estimating. Budget preparation. Materials movement and handling. Graduate engineer. Knowledge Spanish. Prefer another foreign assignment. Box H-655, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

DRILLING AND PRODUCTION Superintendent: Presently employed by Major Company desires change to independent with possible chance for participating. Graduate petroleum engineer. Also experienced in gasoline and recycling plant supervision. Geology. Landwork throughout most of Texas. Box H-656, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER, 30, graduate, seven years exploitation, Production, reservoir experience with major and independent. Desire Mid-Continent. Box H-652, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, eight years subsurface experience, Major Company background, desires connection with firm engaged in Gulf Coast exploration. Box H-659, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED WATERFLOOD Engineer. Seven years diversified, Major and Independent companies; Texas, Louisiana, Mississippi, Arkansas, Kansas, Oklahoma. Extensive secondary recovery, primary drilling, producing, reservoir, lease evaluation, unitization. Employed. Wants more responsible position. Box H-658, The Oil and Gas Journal, Tulsa, Oklahoma.

CHE., 41. Refining engineering operation and management. 17 years experience oil refining units. Box H-624, The Oil and Gas Journal, Tulsa, Oklahoma.

OFFICE MANAGER: Thirteen years with major, last six foreign, Teaching and Engineering backgrounds. Seeking advancement. Married, thirty-seven, can travel, speak Spanish, Best references. Reply Box H-626, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM GEOLOGIST with six years experience, surface, subsurface, drilling, supervisory, consulting, desires employment with independent oil Co. Box H-578, The Oil and Gas Journal, Tulsa, Oklahoma.

REVIEW SEISMOLOGIST: Over ten years computing and interpretation experience Mid-Continent, Rocky Mountains, California offshore, and foreign review. Thirty-three, married. Seeks staff position or consulting affiliation. Details upon request. Box H-646, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST—8 years seis experience, Texas, Oklahoma, desires position with active company or independent. Box H-645, The Oil and Gas Journal, Tulsa, Oklahoma.

REFINERY MANAGER, superintendent or administrative assistant. Experienced catalytic cracking, economics, planning, product control, etc. Excellent background. Degree. Employed. Box H-644, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL PROSPECTOR

AMAZING instructive geophysical literature free on request to oil prospectors and land owners. Write SURFACE OIL SURVEYS, 1414 Electric Bldg., Fort Worth, Texas.

MAP STICKS

ELIMINATE YOUR MAP-HANDLING PROBLEMS! Simply roll your maps on Kraftbilt All-Plastic Snap-On Map Sticks and hold in place with light-weight resilient plastic clips. Bright colored Index Flags plug in one end of each stick, carry labeled identity and instantly "flag" the map you want. Send for new Catalog 1054-B. Ross-Martin Co., P. O. Box 800-A, Tulsa 1, Oklahoma.

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JUST LIKE AN EXTRA PAIR OF HANDS. Kraftbilt 20-ounce cream-colored horsehide weights hug drawings or maps to the table while you work. Hand-sewn with heavy duty stitching, they're shot-filled and round in shape for ease of use and long life. Ask for Catalog 1054-B. Ross-Martin Co., P. O. Box 800-A, Tulsa 1, Oklahoma.

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SWIFT ANALYTICAL CONSULTING LABORATORY
Chemical Analyses
Analytical and Control
Methods Devised
to Fit Your Needs.
P. O. BOX 1942
WILMINGTON, DEL.

ROYALTIES

ROYALTY COMPANY for sale: With or without Production. Contact A. S. Berry, 617 Wright Bldg., Tulsa, Okla.

JACK EAGLE, Oil Properties, 706 City Nat'l. Bldg., Oklahoma City, Oklahoma. Telephone REgent 6-7027.

LEASE AND DRILLING BLOCKS

SEE A. L. BOWLES, Box 947, Ada, Okla., for drilling deals and producing royalties if you have the cash for Oil Investments.

Will pay cash instantly for lease (large blocks), royalties, mineral deeds, production. Write fully—P. O. Box 2153, Denver, Colorado.

160 ACRES, 26 N-14E-NE¼ Sec. 34, Nowata County, Okla. Full ⅞ interest, one fully equipped well, 7 bbls. per day and many good well locations. Unable to attend same as I live in Los Angeles. Price $18,000. Joseph B. Copelan, Phillips Apt. Hotel, Bartlesville, Okla.

LEASES ROYALTIES
Producing and Nonproducing
Bought and Sold—Any Area
Inquiries Invited
B. D. BUCKLEY
6635 Delmar Ave., St. Louis, Mo.

REAL ESTATE

AMBASSADOR HOTEL, Palm Springs, Calif. Property you'd be proud to own, and a tax saver.

FOR LEASE—Attractive Office Building four years old, Tennessee stone and brick with 4 large offices plus reception room. Air Conditioning, Forced Air heating, with plenty of parking and storage space. 44 x 20 ft. warehouse at rear and two 4-room apartments upstairs available. 4430½ E. Admiral Place. Phone 6-0278, Tulsa.

BUSINESS SERVICE

Delaware Corporations formed and serviced. American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware.

WANTED

CONTRACTING DRILLER with Failing or Franks portable rig on truck able to go 2000 to 5000 feet, advise price per foot. Box 555, Claiborne Towers, New Orleans, La.

WANTED—IDEAS
Inventions that are related or can be adapted to the oil industry. We offer capital, technical advice, patent assistance, market research, a manufacturing plant, and a sales outlet; everything to put your invention on the market. Write P. O. Box 1665, Houston 1, Texas.

PETROLEUM AND Natural Gas Engineer, practicing consulting engineering in all phases oil and gas business including writing engineering and reserve reports desires clients on fee or retainer basis. Box 9678, Dallas, Texas.

BUSINESS OPPORTUNITIES

ORGANIZED GROUP of business men financially able to undertake uranium deals of unlimited size, operations, buying claims, active exploration, etc. You are dealing directly with us. Reasonable inquiries will receive prompt attention. Box H-587, The Oil and Gas Journal, Tulsa, Oklahoma.

NEW OIL COMPANY buying proven oil and gas production with incomes ranging from $25,000.00 to $300,000.00 per month. You are writing directly to company officials. Financial statement will be presented to reliable sellers, principals, and authorized brokers. Box H-586, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCING O & G FIELDS
SOUTHEAST NEW MEXICO
Opportunities for high income return with reserve factor of 6.6 to 1 is offered large & small investors, in proven drilling areas. Data on request.
W. J. Peterman, Geologist
1918-1955
Portales, New Mexico

Equipment Men

M. X. Hobbs Forms New Directional Drilling Firm

A materials yard is now well under construction in Houston to accommodate the specialized equipment of a new firm, Zerky Hobbs Directional Drilling. The firm, organized to provide engineering service and equipment for directional drilling, is owned and operated by M. X. Hobbs, who has spent his entire life in the drilling industry.

From 1934 until 1953, Hobbs served Eastman Oilwell Survey Co. and Houston Oilfield Material Co. as directional drilling engineer, working primarily in the Gulf Coast, Louisiana, Oklahoma, West Texas, Arkansas, and Mississippi areas.

Alexson Joins Kellogg's Contract Sales Staff

W. G. ALEXSON

Wallace G. Alexson has joined the staff of the contract sales department of M.W. Kellogg Co., a firm engaged in the design and construction of chemical plants and oil refineries. A chemical engineer, Alexson most recently was in charge of crude-evaluation work for Esso Standard Oil Co. with which company he was associated for 9 years. He also was on loan to the Government for 2 years, serving in an administrative capacity with the Office of Rubber Reserve in Washington, where his primary responsibility was the coordination of the butadiene feed-stock program.

Oil Base, Inc., Elevates Randolph and Brown

At a recent board of directors meeting of Oil Base, Inc., Compton, Calif., (manufacturers of Black Magic), Thad Randolph, vice president and sales manager was elevated to executive vice president and general sales manager. He will make his headquarters at the main plant in Compton.

A. K. (Deacon) Brown, former Mid-Continent sales manager, was appointed

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a vice president and division manager. He will operate out of the Oil Base, Inc., sales offices in Houston.

Girdler's Catalysts Plant Nears Completion

A new plant, designed and constructed by Girdler Co., Louisville, Ky., to meet the steadily rising demand for its catalysts, is nearing completion. It represents an investment of $1,000,000. Girdler is a division of National Cylinder Gas Co., Chicago.

The modern, one-floor-type plant, one of the nation's largest of its kind, is of concrete, steel, and aluminum construction. The plant is located on a 19-acre tract, where all of Girdler's catalyst-manufacturing operations are being consolidated. The site provides ample room for the company's continuing expansion program.

Work on the new structure began in May 1954. It was finished in October 1954, and a few weeks later the first equipment to be moved from the old plant was placed in operation. Transfer of the remainder of the equipment and the installation of additional processing facilities are expected to be completed in April. As the result of scheduling, the company's output of catalysts has increased rather than declined during the change of manufacturing sites.

One area is devoted to dissolving, precipitating, coagulating, drying, and reducing operations. Another embraces calcining, drying, activating, and reducing operations. In the forming area, catalysts are tabletted, extruded, or granulated as required.

Oilwell Supply Transfers Vaussine to New Iberia

Transfer of Armand Vaussine, field representative at Lake Charles, La., for U.S. Steel's Oil Well Supply Division, to New Iberia, La., in the same capacity, has been announced by M. F. Jones, manager of Oilwell's Gulf Coast area.

Vaussine has served as field representative at Lake Charles since joining Oilwell in 1953. He had 6 years' previous oil-field and sales experience.

Minnesota Electronic Mecca Building to Be Completed

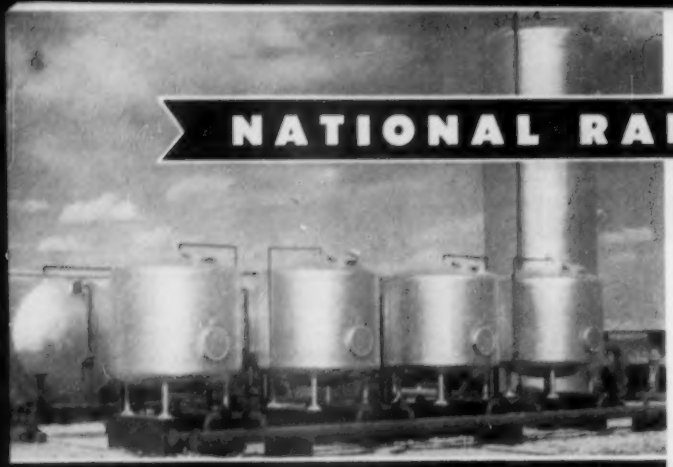
Construction will be completed on a new Minnesota Electronics Mecca building, Santa Ana, Calif., early this spring.

Owned by Librascope, Inc., the new $85,000 Minnesota Electronics structure is considered by the parent company to be another step forward in its objective to achieve leadership in the design and production of industrial computers and controls as industry adopts more and more automatic machinery.

The 10,000 ft. of machine shop in this Minnesota Electronics production plant will be utilized in the production of potentiometers and machinery for commercial use.

Librascope, Inc., and its subsidiaries, including Minnesota Electronics, now design and produce mechanical, electrical, electronic, magnetic, and optical devices; analog and analog-digital computers and controls; electrical precision components; and a complete line of magnetic decision elements and other magnetic components.

NATIONAL RAPID MECHANICAL WATER FILTERS



Four 8' x 5' National Rapid Mechanical Water Filters in West Texas.

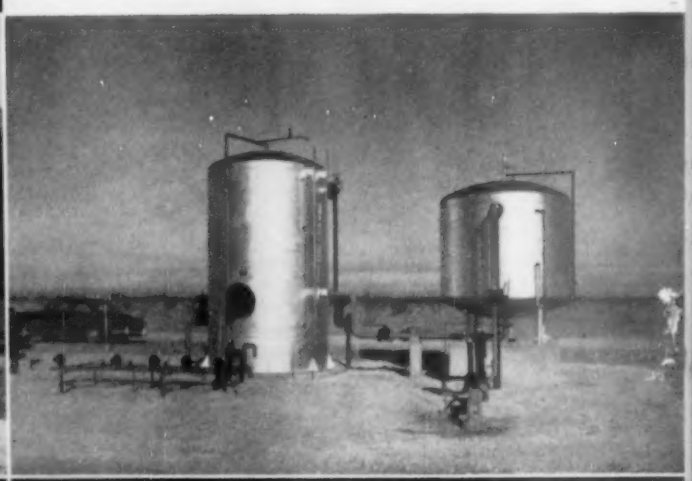
Four 10' x 5' National Rapid Mechanical Water Filters on an Oklahoma water flood project.

National Rapid Mechanical Water Filters are used for filtering water in salt water disposal and water flood projects and municipality installations. Filters are rated according to best empirical values. Common backwash rates are 12 to 20 gallons per minute, per sq. ft. of filter area.

Size	Nominal Water Cap. Bbl./Day	Approxmiate Weight of 40 lb. W.P.
4' x 5'	1060	1400 lb.
6' x 5'	2300	2100 lb.
7' x 5'	3200	2400 lb.
8' x 5'	4200	3200 lb.
10' x 5'	6600	5540 lb.

NOTE: Filters are furnished in 40, 75 and 100 PSI W.P.

A National 4' x 5' Rapid Mechanical Water Filter in a water disposal plant in Texas.



Injection water passes into National Accumulator from National Rapid Mechanical Water Filter.

It's a National

NATIONAL TANK COMPANY

TULSA, OKLAHOMA

3-3-53

STRATAFRAC FRACTURES AND ACIDIZES IN ONE OPERATION

Fast combination treatment by DOWELL increased well potential and boosted allowable

The advantages of chemical acidizing and hydraulic fracturing are combined in a single operation with the exclusive Dowell fracturing service—Stratafrac*. This service is designed to increase oil or gas well production, and to hold rig time to a minimum. No gel-breaker solution is necessary.

Here's an example of the effectiveness of Stratafrac. One operator saw his well's production level off at 40 BOPD pumping, from an initial potential of 123 BOPD. After a Stratafrac treatment by Dowell, the well was repotentialed for 227 BOPD, flowing. Because of this increased potential, *the well's allowable was raised from 123 to 163* BOPD. The gel material used in Stratafrac not only carries the sand in suspension as do other fracturing treatments, but also contains chemical agents to dissolve the acid soluble constituents of the formation rock. Thus Stratafrac is successful in many formations not adaptable to conventional acidizing or fracturing.

There is a Dowell office near you ready *now* to treat your well. You have only to call them, or write DOWELL INCORPORATED, Tulsa 1, Okla., Dept. B-11.

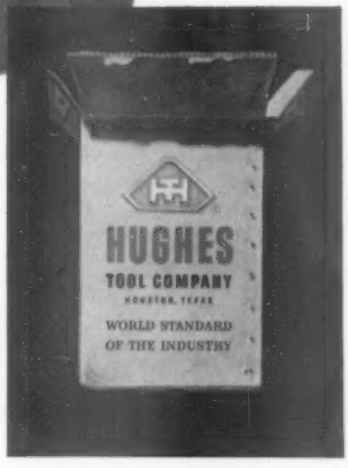
*A Service Mark of Dowell Incorporated.

services for the oil industry

DOWELL

A SERVICE SUBSIDIARY OF THE DOW CHEMICAL COMPANY

HOW TO GET THE MOST FROM YOUR JET BITS



Answers to many of your jet bit drilling problems will be found in the new Hughes bulletin, "Hydraulics for jet bits." It has been prepared for use at the rig. Fully indexed tables and work sheets make it easy to select the liner size, circulation rate and bit nozzle size that will enable you to make the most efficient use of your available hydraulic horsepower.

You can get your copy of this *easy-to-use* copyrighted Bulletin from your Hughes representative. He will be glad to assist you in setting up your jet bit drilling program.